

**ENVIRONMENTAL ASSESSMENT
FOR THE
JOINT TRAINING EXERCISE
ROVING SANDS
AT FORT BLISS, TEXAS AND NEW MEXICO
AND
WHITE SANDS MISSILE RANGE,
NEW MEXICO**

**PREPARED FOR:
U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
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ENVIRONMENTAL ASSESSMENT

Roving Sands 92 Joint Training Exercise

Fort Bliss, Texas and White Sands Missile Range, New Mexico

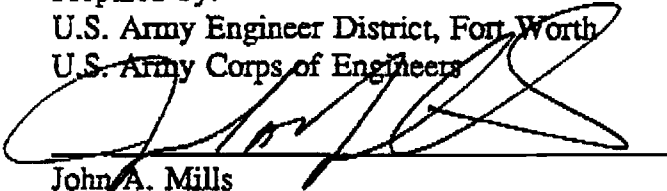
For

The United States Army Forces Command

Prepared by:

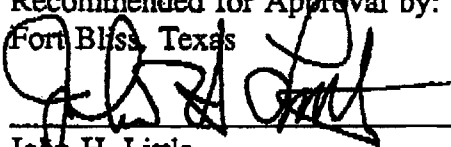
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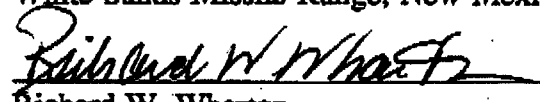
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Notice of Finding Of No Significant Impact

Commander
US Forces Command
U. S. Army Air Defense Artillery Center and Ft. Bliss
White Sands Missile Range, New Mexico

All interested agencies, groups, and persons are hereby notified that the District Engineer, U. S. Army Corps of Engineers, Fort Worth District, has prepared an Environmental Assessment (EA) for the U. S. Forces Command (FORSCOM) regarding the proposed Roving Sands 92 Joint Training Exercise (JTX) to be conducted at White Sands Missile Range (WSMR), New Mexico, and Fort Bliss, Texas and New Mexico.

Purpose and Need for the Proposed Action: The 11th ADA BDE is required to deploy on worldwide joint contingency missions to deter or defeat threats to facilities and forces of strategic importance to the United States. The purpose of this action is to train, test, and evaluate air defense forces in a realistic, integrated air defense scenario that stresses joint interoperability. The proposed JTX will provide units with the required practical training to insure combat readiness and to insure the national security of the United States.

Description of Proposed Action: The proposed action is a joint service (Army, Air Force, Navy, and Marine Corps) air defense exercise involving approximately 10,000 personnel to be held on Fort Bliss, WSMR, and including Roswell Industrial Airport. A limited number of troops will also be deployed on Bureau of Land Management (BLM) lands on the west side of the Organ Mountains. Roving Sands 92 is the third JTX of this type to be held in the area. The alternative of conducting the exercise at other installations was eliminated from further consideration because adequate airspace and terrain were not available to fulfill the JTX requirements. Scheduling this exercise at another time was also eliminated from further consideration because the length conflicts with previously scheduled exercises. The No Action Alternative was eliminated because it would not satisfy the purpose and need for joint training.

Environmental Impact of the Proposed Action: It has been determined that this action would not significantly impact the quality of the environment. Accordingly, an Environmental Impact Statement pursuant to the National Environmental Policy Act of 1969 (Public Law 91-190) is not needed. Reasons for this conclusion are as follows:

Roving Sands 92 will result in minor impacts to soil, air and water quality; ambient noise; and socioeconomic, historic and biological resources. The potential impacts from this exercise will be eliminated or further reduced by planning and mitigation


measures. Consultations with state and Federal agencies and extensive field surveys for historic and biological resources were conducted. Avoidance and control measures to be enforced during the exercise include maneuver damage prevention teams, fire suppression teams and restrictions for unique and sensitive areas. The vast open and remote space and minimization of maneuver activity contribute to the finding of no significant impact. Site selection criteria were developed so that sites used for training are clear of state and Federal threatened or endangered species (including sensitive and candidate species); any historic resources will be placed off limits. Therefore, no threatened or endangered species or significant historic resources would be adversely impacted by this action.

An Environmental Assessment supporting the finding of no significant impact is available for public reading at the following locations: Environmental Management Office (Building 1105, west end), Ft. Bliss, Texas; Environmental Services Division T-150, WSMR; visitor center (public affairs) Building 122, WSMR; the public library where this notice is published; and U. S. Army Corps of Engineers, Fort Worth District. To review this material, please request Environmental Assessment Roving Sands 92 Joint Training Exercise, Fort Bliss, Texas and New Mexico and White Sands Missile Range, New Mexico (U.S. Army 1992). All interested agencies, groups, and persons are invited to submit written comments to the address below within 30 days of this publication date.

For additional information, contact:

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Approved by:
U.S. Army Forces Command


Jared L. Bates
Major General, USA
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 1 APR 1992

Date

EXECUTIVE SUMMARY

Project Description

The Roving Sands 92 (RS 92) is a Joint Chiefs of Staff directed, U.S. Forces Command (FORSCOM) supported Joint Training Exercise (JTX) to be conducted at and above Ft. Bliss, Texas and New Mexico and White Sands Missile Range (WSMR), New Mexico. The Roswell Industrial Airport, Roswell, New Mexico would also be used as a staging area. A small portion of Bureau of Land Management (BLM) lands west of the Organ Mountains would also be used. The JTX would be conducted from 11 May to 22 May 1992. Deployment and redeployment of troops and equipment would occur during the weeks prior to and succeeding the JTX. RS 92 is an air defense exercise which also includes air-to-air combat scenarios, air-to-ground attacks, and live fire exercises.

Summary of Major Environmental Impacts

Exercise activities would not significantly affect the area's geology and soils. Ground maneuvering would be restricted to established maneuver areas; off-road travel to position equipment will be restricted to designated sites, which have been surveyed for historic and environmentally sensitive resources. Off-road operation of tracked and wheeled vehicles would result in soil shearing and/or soil compaction. The loss of soil cohesion from shearing forces may increase the erosion potential of the fine sands and silts found in the valley floors.

Regional ground and surface water supplies are sufficient to accommodate the relatively short-termed increase in water withdrawals. Exercise activities would not be expected to adversely affect ground water supplies. Since the ground exercises activities would be located over 30 miles from the nearest permanent surface waterbodies, no effect to the quality of these resources would be expected. In addition, ground activities are required to be at least 0.25 miles from wildlife tanks.

Air quality impacts would result from dust generation by vehicular movement and from emissions from vehicles and aircraft. Because of the time of year, relative short-term of the exercise, wide-distribution of emission sources and dispersal rates, no significant long-term adverse impacts are expected.

Noise levels will be increased from the additional aircraft flights and ordnance firing/detonation. Supersonic flights would be restricted to altitudes above 10,000 feet above ground level (AGL) over WSMR and, thus, no more than one sonic boom per five days of exercise activities would be expected to be heard outside WSMR boundaries. Other sources, with the exception of helicopter transport to the west side of the Organ Mountains, are not expected to cause noise levels above 65 decibels to be heard outside Ft. Bliss or WSMR boundaries.

No vegetation would be cleared for any RS 92 activities unless absolutely necessary for emplacement of tents. However, vehicle/equipment positioning and troop movement within the designated sites would destroy some plants, particularly succulents, either directly or indirectly by soil shearing/erosion. Sensitive and valuable habitat such as dense yucca stands, mesquite thickets and arroyo-riparian habitat would be avoided.

Some bird species may be disturbed during their nesting season because of RS 92 activities. Some reptiles, toads, and small mammals may be lost from crushing or trampling during ground activities. Larger mammals such as pronghorn, mule deer and coyotes will be disturbed, but are highly mobile and can easily avoid ground activity areas. No significant long term impact to any wildlife populations are anticipated.

No Federally listed or proposed threatened or endangered species would be adversely impacted by the proposed activities. Two protected plant species are located on two sites. A 25-meter radius of these plants would be marked as off limits areas. Overflights above desert bighorn sheep areas are prohibited.

As mentioned previously, the ground activities would be limited to established maneuver areas or within designated sites that have been surveyed for historic resources. Consequently, no effects to any significant historic resources would be expected.

Positive impacts on the socioeconomic resources of the area would occur as a result of RS 92. Area sales volume employment and personal income would increase slightly, primarily near the town of Roswell, but would be short-term. The housing market and recreational and transportation facilities would experience little or no increase in demand. Educational facilities would not be impacted.

Mitigation measures for RS 92, including selection of the designated sites, are discussed in detail in Section V. Many of these measures are established policies of Ft. Bliss, WSMR, and/or the U.S. Department of Defense. A Maneuver Damage Prevention Team would be on-site during RS 92 to enforce all mitigation measures.

Alternatives Considered

Two other military bases were considered as possible locations for RS 92: Nellis Air Force Base, Nevada; and Hill Air Force Base, Utah. However, neither had adequate land and air space to conduct each of the air defense scenarios and, thus, were eliminated from further consideration.

Alternative schedules at Ft. Bliss and WSMR were not practical because of the amount of time needed for RS 92 and the amount of training activities routinely scheduled for these installations. Consequently, the May schedule at Ft. Bliss and WSMR was considered the preferred alternative.

The no action alternative would preclude all impacts, beneficial and adverse. However, the desired training would not be accomplished and combat readiness in emergency situations could not be assured.

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SECTION I
INTRODUCTION

I. INTRODUCTION

This Environmental Assessment (EA) addresses the potential impacts associated with the Roving Sands 1992 (RS 92) Joint Training Exercise (JTX) to be conducted at White Sands Missile Range (WSMR), New Mexico, and Ft. Bliss, Texas and New Mexico (Figure 1-1). This EA was prepared by Geo-Marine, Inc. for the U.S. Army Corps of Engineers, Fort Worth District, under Contract No. DACW63-90-D-0061, Delivery Order No. 15.

Detailed descriptions of the proposed activities are presented later in this section, including the purpose and need for the action. Alternatives to the proposed project are discussed in Section II. The baseline condition of the natural and socioeconomic resources within and near the project area are presented in Section III (Affected Environment), while Section IV describes the impacts, beneficial and adverse, expected to occur upon implementation of the proposed action. A more detailed discussion of mitigation measure/programs to be emplaced is presented in Section V.

The U.S. Forces Command (FORSCOM) will prepare a Programmatic Environmental Impact Statement (EIS) to address the potential long term cumulative effects of annually conducting the continuing RS Program. The Programmatic EIS is being prepared simultaneously with the RS 92 EA; consequently, this EA will address only the anticipated impacts associated with the 1992 exercise.

GENERAL

Ft. Bliss is located in El Paso County, Texas and Otero and Dona Ana counties, New Mexico, and encompasses approximately 1.12 million acres. About 89 percent of this acreage is located in New Mexico, most of which comprises the maneuver and training lands known as McGregor and Dona Ana/Orogrande Ranges (Figure 1-2). The RS 92 JTX ground activities would primarily occur on Ft. Bliss maneuver areas and McGregor Range. Air-to-air exercises and limited ground activities will be conducted over Ft. Bliss restricted airspace and White Sands Missile Range (WSMR) located adjacent to McGregor Range.

In addition, some ground activities associated with air-to-ground defense exercises will also be conducted within the Dona Ana/Orogrande maneuver areas. Since impacts associated with similar training activities have been addressed already (U.S. Army 1984b), these effects will not be discussed in this EA. Maneuvering on these areas has been associated with the ongoing mission at Ft. Bliss. The potential impacts vary in degree due to the number and type of vehicles, duration and frequency of maneuvering, and types of vegetation and soils. The Dona Ana/Orogrande maneuver areas have been used on a recurring basis.

PURPOSE AND NEED FOR THE ACTION

The 11th Air Defense Artillery (ADA) Brigade (BDE), a contingency brigade, is required to deploy on worldwide joint contingency missions to deter or defeat threats to facilities and forces that are of strategic importance to the United States. RS



Figure 1-1. General location of training areas used by the JTX, RS 92.
Source: U.S. Army 1976.

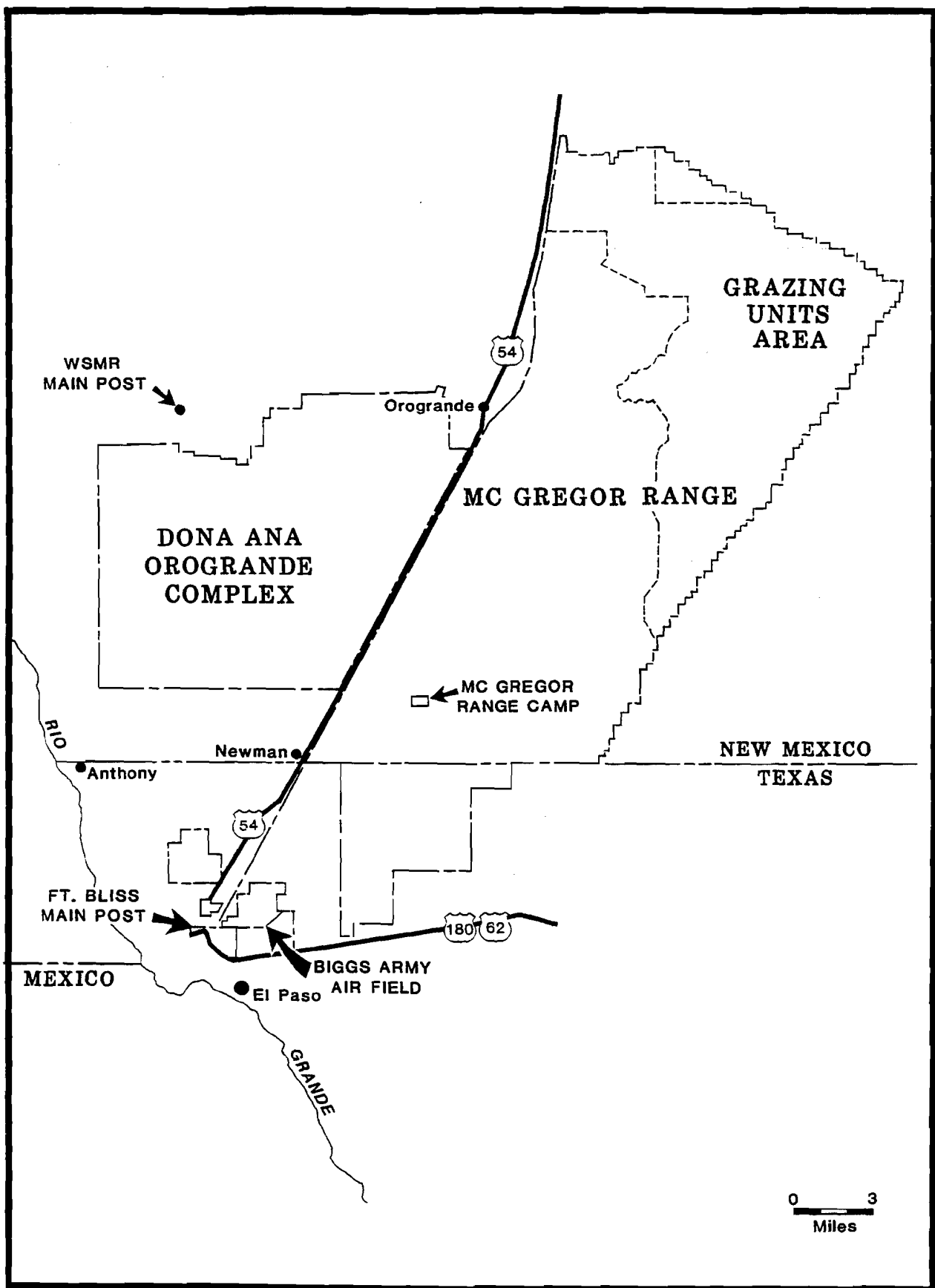


Figure 1-2. Installation layout of Ft. Bliss.

92 will bring together elements from the active and reserve Army ADA; Marine Corps HAWK missile units and command and control facilities; Navy combat and command and control aircraft; and Air Force combat and support aircraft and control facilities. These participants will perform contingency mission training in a joint and combined arms setting and provide a simulated combat environment to allow training and evaluation of multi-service commanders, forces and equipment. The proposed JTX will provide FORSCOM with the required practical training to insure combat ready forces during emergency situations and to insure the national security of the United States.

EXERCISE DESCRIPTION

The Joint Chiefs of Staff (JCS) directed FORSCOM to sponsor and coordinate a joint training exercise program to satisfy the needs and objectives described above. RS 92 will be conducted in four phases as described below.

Phase 1. Deployment of Forces

The deployment phase of the JTX will commence on 4 May 1992 and continue through 11 May 1992. During this time the participating forces will move all personnel and equipment from their respective home bases/stations to the proposed exercise locations.

The majority of the equipment and personnel will be brought in to Biggs Army Airfield (AAF) by railroad and truck. Transport/cargo aircraft (e.g., C-130, C-5) will also be used for deployment purposes. Other airplanes and helicopters will be flown to their designated exercise locations (i.e., Roswell Industrial Airport, Biggs AAF and Ft. Bliss).

Approximately 8,500 personnel will participate in the JTX. Most of the vehicles are wheeled; fewer than 100 tracked vehicles will be used. Approximately 4,450 personnel will be deployed to field positions not located at designated range camps, i.e., Orogrande, Stallion, etc. The total estimated number of units and associated personnel/equipment currently authorized for RS 92 is shown in Table 1-1.

Phase 2. Transition

The transition phase insures that all personnel and equipment are properly positioned in the maneuver areas and ready to execute the exercise. The 11th ADA BDE will conduct a series of communication exercises from fixed positions to insure all command and control systems are in place and operational prior to the start of the exercise. Orientation training will also be conducted during this phase to insure that troops are aware of exercise environmental regulations governing off-limit areas, fire prevention and control measures, and pertinent points of contact.

Phase 3. Joint Training Exercise

The RS 92 JTX is scheduled from 11 May to 22 May 1992. The exercise will involve three major activities: (1) ground activities, (2) air activities, and (3) live fire exercise.

Table 1-1. Estimated force strength for the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas.

Type Unit	Total No. Personnel	Vehicles (W/T) *
Patriot Battalion	1600	450/0
HAWK Battalion	1600	820/0
Chaparral Battalion	360	90/40
Vulcan/Stinger Battalion	690	220/45
Ordnance/Maintenance Battalion	600	600/0
BDE Level HQ/Staff	300	120/0
Other:		
Biggs AAF, USAF	820	40/0
Roswell, USN	1600	50/0
Logan Heights, TACC	350	30/0
Orogrande, TAOC (USMC)	230	100/0
Logan Heights, JECG	200	100/0
McGregor Range Camp, CRC	200	40/0
TOTALS	8550	2660/85

*W/T Wheeled/Tracked

Ground Activities

Most of the ground activity will occur within Ft. Bliss training areas (i.e., McGregor Missile Range and Dona Ana/Orogrande maneuver area). These areas will be used to maneuver and position several types of air defense gun and missile systems.

Units will also be deployed on and around Otero Mesa in the northern region of McGregor Range. Five 30-acre areas will be used for positioning HAWK and/or Short Range Air Defense (SHORAD) units. In addition, 16 pre-selected and environmentally cleared 1-km² areas will be used to maneuver and position (defined as off-road traffic to static positions) Patriot missile systems. Specific locations for the training sites are presented in Section III. A contingent of approximately 600 personnel from 11th ADA BDE will operate on Otero Mesa for the first week of the exercise.

Generally, SHORAD units will be deployed at or below platoon levels and will position within a fixed radius of a position/asset to be defended. They usually will move about every four hours. Patriot and HAWK units will be deployed at or below battery levels and will remain in position for at least 24 hours after which units will proceed to another environmentally cleared location.

A U.S. Marine contingent of about 250 personnel will bivouac at Orogrande Range Camp and establish a Tactical Air Operations Center (TAOC) in the vicinity of Elephant Mountain. A U.S. Air Force contingent of about 200 personnel will be based at McGregor Range Camp. They will establish a Control and Reporting Center (CRC). It will be the CRC's and TAOC's responsibility to control the entrance and exit of aircraft in the exercise airspace. A combination of U.S. Navy and U.S. Air Force personnel will be temporarily based at Roswell Industrial Airport. This contingent will be made up of approximately 1,600 personnel who will be housed in local motels/hotels. Approximately 310 personnel will be working in and around the Logan Heights Training Complex next to the Ft. Bliss main base. These personnel will be part of the Tactical Air Command Center (TACC) and Joint Exercise Control Group. Their responsibility will be to command and control the exercise. About 820 personnel will be working out of Biggs AAF which is located next to Ft. Bliss. This contingent is made up of almost all U.S. Air Force personnel. These personnel along with those at Logan Heights will be housed in on-base barracks, officer's quarters, and motels/hotels in the local El Paso area.

On the west side of the Organ mountains and south of U.S. Highway 70, a total of approximately 20 foot soldiers will be on BLM land to simulate Stinger anti-aircraft missile operations. Two or three 3-man teams will be deployed to the area. The area north of Soledad Canyon and south of Dripping Springs is off limits, as well as Baylor Canyon. Troop insertion by helicopters is allowed south of Soledad Canyon Road, but only by ground vehicle north of the road.

In addition to target tracking and acquisition training, ground defense participants will use live ammunition and pyrotechnics (blanks, smoke grenades, flares, etc.). Tear gas (CS) will be ground dispersed to simulate chemical attacks (all CS used will be of the CS 1 variety). Live ammunition will be used only at established and designated live fire ranges, while pyrotechnics will be used throughout designated exercise areas on McGregor

Range. The types and quantity of live ammunition and pyrotechnics expected to be used are presented in Table 1-2.

Approximately 60 additional sites near the Stallion Airfield in the northwestern portion of WSMR will also be used as ground-to-air defense sites. Exercises at these sites will require approximately 350 personnel to operate from Stallion Range Center and approximately 250 personnel to operate from North Oscura Peak. These sites have all been previously disturbed (graded) and are borrow pit areas adjacent to developed roads. The acreage and type of units expected to use the sites are as follows: assault firing unit, 40 acres; battalion, 30 acres; battery, 10 acres; night defensive position, 5 acres; and firing unit, 5 acres. Additionally, Chaparral units will be placed on the shoulders of 22 segments of WSMR range roads. Two wildlife water wells will be reinstalled at Granjean and Mine site. Also, the inactive runway at Stallion Airfield will be repaved. Each site has also been surveyed for and "cleared" for significant natural and cultural resources by WSMR Environmental Services Division (ES-E). Since no significant impacts to these sites are expected (U.S. Army 1985), they are not addressed further in this document.

Parachute operations involving equipment will also occur on WSMR near Stallion AAF. The air drop zone is presented on Figure 1-3. There will be a maximum of five days when three containerized cargo system pallets will be dropped from two planes per day. A maximum of 30 pallets are anticipated to be dropped during the exercise.

Electronic countermeasures (ECM) operations will include the use of chaff to disrupt specific radar frequency bands. Chaff (fiberglass coated aluminum fibers) fibers have a one millimeter diameter and range from 0.38-2.0 inches in total length. Approximately 15,000 pounds of chaff will be dropped in restricted airspace over the northern portion of WSMR. Restricted airspace for use of chaff is 2,000 feet AGL and below. Chaff will not be dispersed over the Ratscat radar site, Ram radar site, WSMR main post, White Sands pupfish area, Jarilla Mountains, White Sands National Monument, Organ Mountains, Lake Holloman, and Holloman AFB. Chaff has two primary applications; both are used to confuse radar systems. Chaff can be used to decoy incoming surface-to-air or air-to-air missiles into firing at the chaff cloud rather than the aircraft. The second application of chaff involves saturation of radar signals so that the radar cannot distinguish between the aircraft and the dispersed chaff. Two tests have been conducted in the last three months with quantities less than 35 pounds to test the effect of chaff on local radars (Ball 1992). The estimated ground level dispersion of chaff dispersed at 500 feet AGL will cover the ground at a rate of one ounce per acre. Since similar actions have not been conducted at WSMR nor have been addressed by previous WSMR documentation, potential effects of these actions are described in this EA.

Air Activities

There are many types of air activities that will occur during the JTX including air-to-ground and air-to-air attacks. Two 90 minute attack periods will be conducted during daylight hours over WSMR and Ft. Bliss restricted airspace with approximately 125

Table 1-2. Types and quantities of live ammunition and pyrotechnics expected for use in the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas.

<u>Ammunition</u>		<u>Pyrotechnics</u>	
Type	Quantity	Type	Quantity
HAWK missile	21	5.56mm (M16) Blank	215,500
Patriot missile	12	7.62mm (M60) blank	41,000
Stinger missile	23	.50Cal (M2) blank	12,600
Redeye Missile	15	Grenade, Frag practice	443,250
Chaparral missile	17	Grenade, Smoke, various colors	900
40MM Grenade (M203)	4,000	Grenade, Hand CS ¹	69
20MM	60,000	Capsule, CS ¹	53
7.62mm 9M60)	137,000	Flares	340
5.56mm (M16)	500,000	Cartridge, tank, practice	1,400
9mm	18,000		
Claymore, Mine	43		

↑ All CS used is of the CS1 variety.

sorties per daylight period. Up to 50 (10 bomber and 30 fighter aircraft, and 10 transport aircraft/helicopters) night flights could also occur. Night flying could occur between dusk and dawn. These aircraft will originate from Roswell Industrial Airport and Biggs AAF and engage in the training exercise only in the designated airspace. Inert training ordnance (30mm ball ammo, BDU-33 practice bombs and MK-106 practice bombs) will be dropped on established target areas within the Red Rio and Oscura bombing ranges located in northern WSMR (Figure 1-3). Air and noise impacts associated with air exercises and training ordnance for the established bombing targets have been assessed previously (U.S. Air Force 1991).

Approximately 300 sorties per 24 hour period (a sortie is defined as one aircraft leaving the runway performing its mission and returning) will be flown. The types of aircraft and the expected sorties to be flown by each type are presented in Table 1-3.

Aircraft will begin the air-to-ground attacks from the north-central portions of WSMR, normally in groups of four aircraft, and proceed southeasterly toward Ft. Bliss. General flight approaches are represented in Figure 1-4. Aircraft from Roswell will use preapproved Federal Aviation Administration (FAA) routes. Aircraft will return generally along the same routes after completing the attack. Low-level use of restricted airspace over the National Aeronautics and Space Administration (NASA) Johnson Center and WSMR main post has been granted to allow realistic tactical use of the airspace without having to fly over the San Andres National Wildlife Refuge (NWR), Strawberry Peak, and other areas on WSMR which support desert bighorn sheep. Air attacks over Ft. Bliss maneuver area targets may involve flights down to 100 feet (AGL); however, flights over WSMR will be limited to a minimum altitude of 500 feet AGL. No flights over areas populated with sheep will be allowed except in case of an emergency. The U.S. Army Environmental Hygiene Agency will conduct a noise monitoring study during RS 92 on the San Andres NWR and other areas containing bighorn sheep.

Both B-52 and B-1B bombers will participate in simulated bombing runs. The B-52s will drop inert ordnance on approved target areas within the Oscura Bombing Range and then continue south to leave the area. It is estimated that B-52s will fly 12 sorties during each 24 hour period. The B-1Bs will fly an estimated six sorties per day and six sorties per night, flying the same path as the B-52s. All bombers will fly at or above 500 feet AGL during the day and at or above 600 feet AGL during night missions. Bomber aircraft will use FAA approved IR-133 route for access into WSMR restricted airspace.

Helicopter search and rescue (SAR) training operations will occur in the north-central area of WSMR during air activity windows. Helicopters will fly under 500 feet AGL and will observe the same no fly areas as jet aircraft as described below.

Six areas on WSMR have been designated no-fly areas to avoid adverse impacts (Figure 1-3). A 3,000-m diameter surrounding the fastburst reactor at the Nuclear Effects Lab Area will be avoided. No overflights will be allowed over the San Andres NWR and

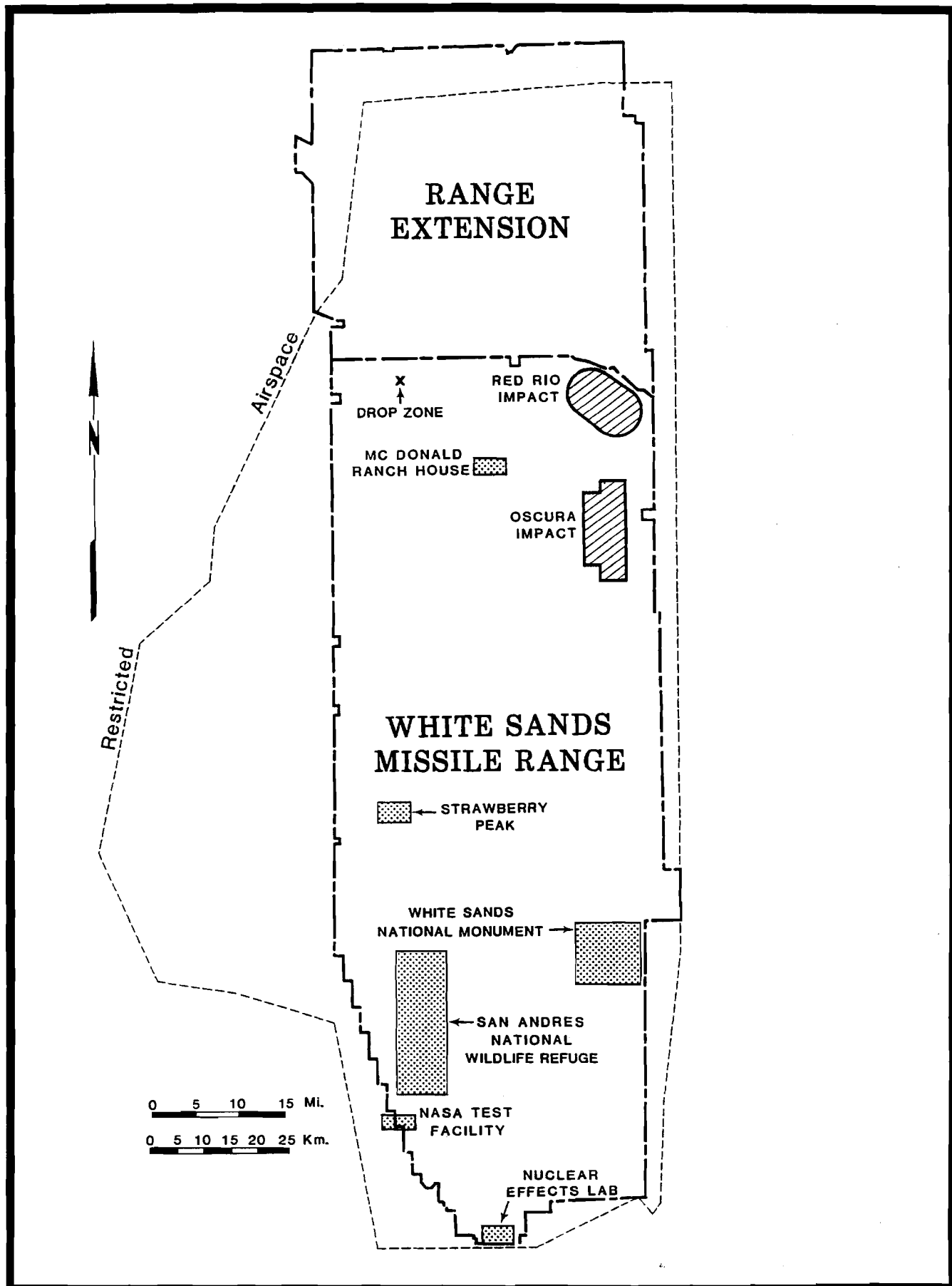


Figure 1-3. No fly areas and impact areas on White Sands Missile Range for the JTX, RS 92.

Table 1-3. Aircraft used in the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas.

AIRCRAFT TYPE	MISSION	NUMBER OF SORTIES PER 24-HOUR PERIOD (ESTIMATED)
F-16	Interdiction	12
EA-6B	Electronic Counter Measures	10
FA-18	Interdiction	90
A-6	Interdiction	24
F-111	Interdiction	8
B-1	Interdiction	12
B-52	Interdiction	12
RF-4C	Photo Recon	6
F-14	Escort	16
E-2C	Command and Control	5
S-3	Electronic Counter Measures	4
EC-130	Electronic Counter Measures	2
MC-130	Special Operations	6
MH-60/SH-60	Special Operations	10
F-15	Defensive Counter Air	40
E-3	Command and Control	2
A-10	Close Air Support	12
C-130	Tactical Airlift	25
Total		298

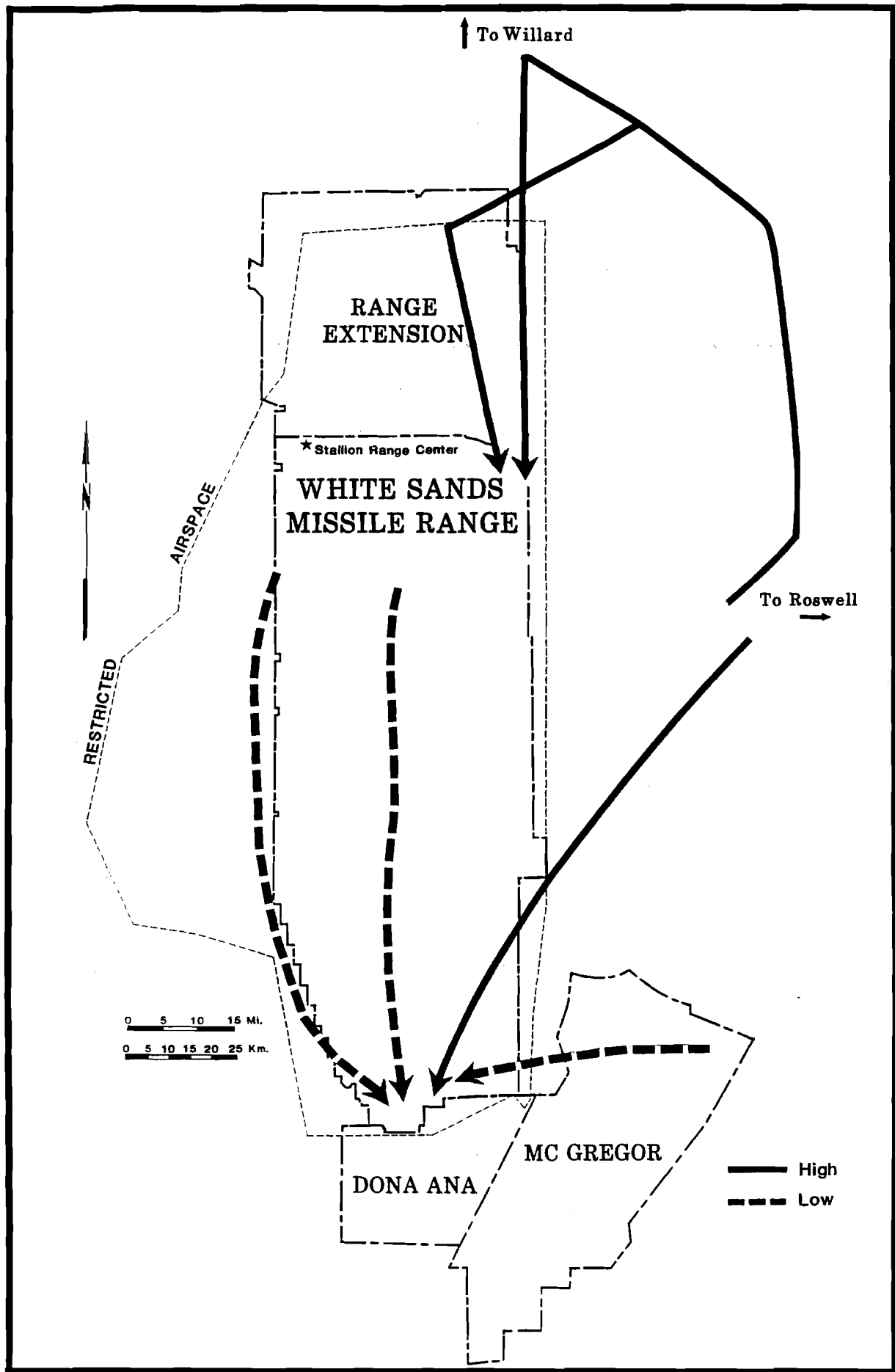


Figure 1-4. Expected general flight approaches for the JTX, RS 92.

Strawberry Peak. The NASA Test Facility, including the antenna farm will be avoided. The main entrance and picnic area of the White Sands National Monument, surface to 3,000 feet AGL will be avoided. No supersonic flights over the McDonald Ranch House will be allowed. Finally, no flights below 500 feet AGL and no through-canyon flights in the Organ Mountains will be allowed.

Live Fire Exercise

At the conclusion of the ground and air scenario, the 11th ADA BDE will fire several gun and missile systems using live ordnance. Air defense units will fire approximately 21 HAWK missiles, 12 Patriot missiles, and 60 Stinger/Redeye/Chaparral missiles. In addition, approximately 60,000 20-mm caliber rounds will be fired from the Vulcan gun systems. Impacts associated with this type of activity have been addressed by the U.S. Army (1984b) and thus are not discussed in this EA. All ordnance firing will occur on the established firing range at Ft. Bliss, thereby eliminating the need for additional modifications/excavations for range preparation. Two Patriot missiles will be fired from an environmentally cleared training site on Otero Mesa to intercept a Nike missile fired from an established firing range on McGregor Range.

Phase 4. Redeployment of Forces

This phase will last approximately one week (23 May-31 May) and will involve three major tasks. Each task or portion thereof may be conducted simultaneously. The first task will be the field evaluation and critique of the JTX, which will begin immediately prior to or upon cessation of the actual exercises. Redeployment of troops and equipment will comprise the second task, which will be accomplished in reverse order in which these resources were deployed. The third task will involve an inspection team, comprised of FORSCOM, 11th ADA, BLM, WSMR ES-E and Ft. Bliss environmental personnel that will inspect the areas used during RS 92 to insure that installation regulations and all appropriate Federal and state environmental regulations/guidelines have been satisfied.

Support Activities and Facilities

Decontamination

The 89th Chemical Company will conduct periodic equipment decontamination training throughout the Ft. Bliss exercise area and Stallion Range Camp and Trinity Site parking lot on WSMR. Equipment decontamination involves the use of high pressure hoses, using water to simulate the washing of chemical contamination from equipment. If erosion occurs, restoration of the site will occur.

Petroleum, Oils and Lubricant (POL) Storage/Distribution

Fuel dispensing stations will be at battalion headquarter locations and at various Forward Arming and Refueling Points (FARP). The Biggs AAF fueling point will consist of two 50,000 gallon fuel bladders with three 350 gallons per minute (GPM) pumps. The bags will be placed in existing berms on the airfield.

There will also be 13 organizational refueling points at battalion headquarter locations. These refueling points will use 1,200-2,500-gallon refuelers.

There will be two FARPs, each having two 5,000 gallon tankers hooked in series, connected to a 350 GPM pump. All 350 GPM pumps will be on the ground, with any joint/coupling having drip pans or other absorbent materials to contain any leaks/spills during uncoupling activities. All contaminated absorbent materials will be transported back to the Ft. Bliss main post and disposed of through the Defense Reutilization and Marketing Office or other approved procedures. Disposal of contaminated soil will be in accordance with installation regulations or guidelines and those of the Texas Health Department or the New Mexico Environment Department.

Leaded gasoline/Diesel/JP-8 will be the types of fuels used. Leaded gasoline is required to operate some vehicles and equipment. These fuels will be available in bulk quantities ranging from 600 gallons to 10,000 gallons in fuel trucks specifically designed for bulk storage and dispensing. Additionally, smaller amounts will be stored and transported in 5-gallon fuel cans to meet operational requirements. The bulk storage/dispensing vehicles are at battery, battalion and brigade headquarters locations. These vehicles will be dispersed throughout the maneuver area and Otero Mesa.

A variety of oils and lubricants will also be used, including engine oil, transmission fluids, hydraulic fluids and lubricants of various types. These fluids will be stored/transported in containers ranging from 55-gallon drums to 1-ounce bottles. The bulk quantities of these oils are generally stored in transportation trailers (0.75 to 1.5 ton) at battery, battalion, and brigade headquarters locations. Smaller amounts of the oils, generally 5-gallon cans to 1-ounce bottles, are carried on individual vehicles which will be traveling throughout the exercise area.

Hot refueling of CH-54 aircraft will occur on the aircraft ramp at Stallion Airfield at WSMR. The aircrews will conduct the refueling operations and will follow applicable regulations for hot refueling. All designated refueling points on WSMR will be north of Mockingbird Gap.

Hazardous Substances

Units also have solvents, cleaning compounds, battery acid, and other POL products necessary for the operation of the defense and support equipment. These products are generally stored/transported in 5-gallon or smaller containers located at battery, battalion, and brigade headquarters locations. These products are used in very limited quantities in the field and are generally stored in bulk quantities in maintenance facilities designated for the use of these products. Only emergency cleaning operations will be conducted in the exercise area.

Radioactive Substances

Subradioactive materials are found in various Nuclear, Biological and Chemical (NBC) pieces of equipment. The types of equipment include: M8A1 Chemical Alarm, Americium 241, radioactive source; Chemical Agent Monitor, Nickel-63, Beta radiation source;

Radiac Meter IM-174/PD, 1.0 microcuries, RA-226; and Radiac Set AN/PDR-27, Krypton-85. This equipment is located at all levels and will be used throughout the maneuver area. Repair, removal, or disposal of radioactive materials is not conducted at unit level. These materials are turned in to higher level, permanent repair facilities for maintenance, repair, and disposal. Hazardous and radioactive substances will be disposed of in accordance with the installation hazardous waste management plan (U.S. Army 1988). The respective Radiation Protection Officer for Ft. Bliss or WSMR must be contacted for incidents involving radioactive materials. Radioactive substances will be disposed of in accordance with installation policy at Ft. Bliss and WSMR.

SECTION II ALTERNATIVES

II. ALTERNATIVES

This section describes the alternatives that were considered. The amount of available airspace and ground maneuver area, available transportation routes for logistics purpose, and scheduling were main considerations.

ALTERNATIVE SITES ELIMINATED FROM FURTHER CONSIDERATION

In addition to the Ft. Bliss/WSMR area, Nellis Air Force Base (AFB), Nevada and Hill AFB, Utah were considered as possible RS 92 alternative locations. Both of these bases have sufficient airspace to accommodate the air-to-air combat scenario. However, neither has adequate terrain (size or type) to properly allow training under the ground to air defense scenario. The alternative of conducting the exercise at other installations was eliminated from further consideration because adequate airspace and terrain were not available to fulfill the JTX requirements.

ALTERNATIVE SCHEDULES ELIMINATED FROM FURTHER CONSIDERATION

The Ft. Bliss maneuver areas are heavily utilized throughout the year for various training activities. Furthermore, high winds and seasonal rainfall prior to and after the proposed exercise dates conflict with scheduled training exercises and environmental protection by causing soil compaction and soil loss. The only time frame available for RS 92 which can accommodate the relatively long exercise is the month of May, although this schedule may conflict with the breeding season of some bird and/or mammal species.

PREFERRED ALTERNATIVE

The conduct of RS 92 at Ft. Bliss and WSMR is considered the best alternative that will provide maximum airspace as well as ground maneuver areas for both air-to-air and air-to-ground attack scenarios. The number of available highways, railroads and commercial/military airports to the Ft. Bliss/WSMR area greatly facilitate the mobilization/demobilization of the troops and equipment, thereby adding to the attributes of this alternative.

A critical site selection process has been incorporated which emphasized avoidance or reduction of adverse impacts to breeding birds and mammals, soils, water supplies, historic resources, and other significant resources.

NO ACTION

The No Action alternative is considered a viable alternative. Although no impacts, beneficial or adverse, would occur if implemented, the No Action alternative would not satisfy the purpose and need for joint training. The No Action Alternative would result in the loss of the only JCS directed/FORSCOM sponsored air defense exercise that occurs in any given year. Roving Sands is the only multi-services air defense exercise that actually plans and executes an operation. It involves all four Services and tests our joint air defense interoperability capabilities.

SECTION III AFFECTED ENVIRONMENT

III. AFFECTED ENVIRONMENT

This section describes the natural resources within and near the exercise area. The exercise area for environmental concerns includes specific areas on Ft. Bliss, WSMR, Biggs AAF, and Roswell, New Mexico that will be used during the exercise. The area outside, but including the direct exercise area, is termed the project area.

The exercise area extends from the western border of Texas at El Paso into south-central New Mexico. It is between the San Andres, Organ, and Oscura Mountains on the west, and Sacramento and Hueco mountains on the east. Between the mountain ranges lies the Tularosa Valley and the Hueco Bolson. Most of the ground activities will take place on the Ft. Bliss Dona Ana/Orogrande maneuver areas and McGregor Range.

The parameters that are described in this section include climate, water supply and quality, geology and soils, air quality, ambient noise, socioeconomics, and historic and biological resources. Descriptions of surface parameters are limited mostly to McGregor Range on Ft. Bliss. Impacts associated with annual training exercises on Ft. Bliss maneuver areas, (i.e., Dona Ana/Orogrande complex), have been addressed previously (U.S. Army 1984a and 1984b). Previous training activities on Otero Mesa and Tularosa Valley have been limited and potential impacts from military exercises in these areas, as are proposed during RS 92, have not been analyzed (U.S. Army 1989, 1990). Thus this EA focuses primarily on the anticipated effects on the resources on McGregor Range.

CLIMATE

The area has an overall arid, continental climate characterized by low relative humidity, hot summers, moderate winters, and wide variations in temperatures (USDA 1976, 1981). Some semi- and sub-humid climatic zones exist at higher elevations in mountain ranges due to increased precipitation. Soil water loss is highest during the dry season from winter to early summer. Dust and sand storms often occur during the spring months. Thunderstorm activity is frequently intense during the mid-summer rainy season. Average annual snow accumulations is 4.6 inches, but there is rarely more than one inch of snow cover and it seldom remains for more than one day.

Average daily maximum temperature is 76°F; average daily minimum temperature is 51°F. The freeze-free period averages 235-248 days per year. November 12-15 are the average dates for the first killing frost and March 9-20 are the average dates for the last. Weather conditions during the exercise period (May) are moderate. Temperature extremes are 57°F-87°F and average 72°F. Average rainfall for May is 0.40 inches.

Annual precipitation is sufficient only to maintain desert vegetation. Average annual rainfall is less than eight inches in the valley and about 20 inches at higher elevations in the mountains. More than half of the annual precipitation falls during July-September.

Average relative humidity ranges from 51 percent at 6 a.m. to 26 percent at 6 p.m. local standard time. Evaporation from Weather Bureau pans four feet in diameter is high in the arid environment, averaging about 105 inches per year on the desert floor. The resulting potential deficit in precipitation is 97 inches each year.

GEOLOGY

The exercise area is located in the southeastern portion of the Basin and Range Province, an area of north-south mountain ranges and high mesas separated by the broad expanses of the Tularosa Valley and Hueco Bolson (US Army 1976, 1984a). The San Andres, Oscura, Organ, and Franklin mountains on the west, and the Jarilla, Sierra Blanca, Sacramento and Hueco mountains on the east border the flat desert lowland. The mountain ranges are approximately four to 30 miles wide and extend to about 60 miles. Maximum crest elevations of these ranges are 6,500-8,500 feet mean sea level (MSL) and rise 4,000 feet above the valley floors. Salinas Peak is the highest elevation in the project area at 8,958 feet MSL.

Paralleling the mountain ranges, the Tularosa Valley-Hueco Bolson was essentially a stable, relatively shallow marine shelf from late Cambrian through early Pennsylvanian time. The oldest sedimentary deposits are approximately 400 million years old consisting mainly of dolomite beds which range in age from late Cambrian to late Ordovician (Pray, 1961). Marine sedimentation buildup was interrupted in late Pennsylvanian time by tectonic disturbances that altered the sedimentation origin from marine to terrestrial. Late Permian strata are sedimentary limestones and represent this intrusion of water once again into the area. In late Tertiary time, uplifted tilted fault blocks formed the mountain ranges that enclose the desert basin. The Tularosa and Hueco basins have been receiving sediments washed from the surrounding mountains for the past one million years.

The Tularosa Valley-Hueco Bolson is a structurally continuous depression more than 200 miles long and 25-60 miles wide. The relatively flat surface slopes from east to west ranging in elevation from about 4,000-4,300 MSL. The Jarilla Mountains, just north of the Texas-New Mexico state line, occur at the indistinct topographic divide that separates the Tularosa Valley on the north and the Hueco Bolson on the south.

The arrangement of layers of strata reflect the historical deposition of sedimentary materials. The Tularosa Valley-Hueco Bolson consist of a thick sequence of unconsolidated sand, gravel, clay, and caliche ranging from Recent to Tertiary Age. Surface materials are fine-grained and become very coarse to gravel and boulder size near the escarpments of the adjacent mountain ranges. Alluvial fans slope outward from the bases of the mountains, coming together to form broad aprons that merge into the flat alluvial plain deposits in the central portions of the desert lowland.

SOILS

Major soil associations for McGregor Range are presented in Figure 3-1. Five other minor soil associations also occur in the area but comprise a combined total of less than one square kilometer, and thus are not illustrated. Mostly calcareous and alkaline, the soils have developed from weathering of limestone, sandstone, and igneous bedrock with intrusion of windblown (eolian) deposits from relic lakebeds. The soils are moderately well drained to indurated caliche (cemented calcium carbonate) or bedrock near the surface in some areas. Depth of soils varies from a few inches on slopes to more than five feet in alluvial valleys. Table 3-1 presents descriptions of the major soil associations found within or near the exercise area. The identification and distribution of 37 soil types encountered within WSMR is presented in the Installation Environmental Assessment (U.S. Army 1985).

WATER SUPPLY AND QUALITY

The groundwater supplies for the El Paso area, including Ft. Bliss, are derived from two basins separated by the Franklin Mountains. The Hueco Bolson includes about 70 percent of El Paso County and extends south several miles into Mexico and north into New Mexico. Almost all of the water supply for the area is provided by deep wells within the Hueco Bolson. Thirty-nine wells on Ft. Bliss provide water. The Mesilla Bolson lies west of the Franklin Mountains, extending along the Rio Grande Valley into New Mexico and Mexico. The geology of the Lower Mesilla Valley in the Mesilla Bolson containing the Canutillo Well Field is similar to that of the Hueco Bolson and the basin fills are contemporaneous formations of Recent and Santa Fe age (Cliett, 1969).

The maximum thickness of the Hueco Bolson fill material, which parallels the base of the Franklin Mountains, is about 9,000 feet. The fill can be divided into two primary types, fluvial and lacustrine, but other deposits such as alluvial-fan and eolian sediments occur throughout the area. Groundwater is obtained from fluvial and lacustrine deposits, but the primary source for the area is the fluvial aquifers.

Brackish to saline water (700-2,500 parts per million [ppm] total dissolved solids [TDS]) occurs within 200 feet of the bolson surface. In the underlying lake sediments beyond a thin transition zone of brackish water, TDS levels range to 50,000 ppm. Past efforts to obtain potable water from upland deposits on Ft. Bliss and the surrounding areas have been unsuccessful. Concentrations of chlorides, sulfates, and TDS often exceeded maximum permissible levels. Below the fluvial deposits of brackish and saline water, freshwater occurs under artesian pressure which raises the aquifer to within 40 feet of the ground surface in various wells along the Rio Grande. Measured depths to this "sandwiched" fresh water layer average 250 feet in sand deposits with clay lenses, but fresh water occurs as deep as 1,200 feet.

Water quality in the Hueco Bolson fresh water aquifers is good, requiring only chlorination. Chemical analyses (El Paso Water Utilities, 1990) indicate that TDS, hardness, chloride,

Figure 3-1. Major soil associations found within the exercise area for the JTX, RS 92.

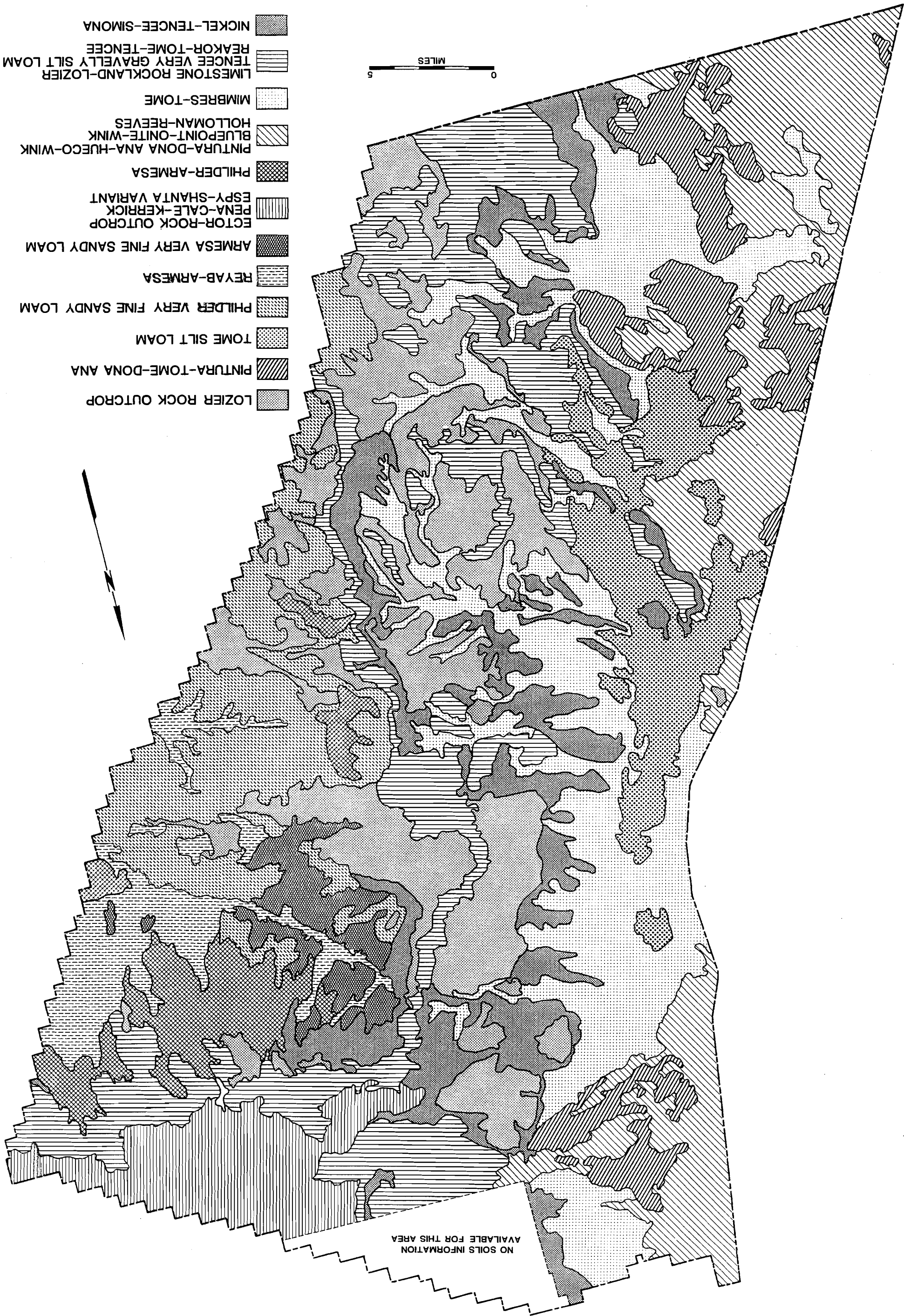


Table 3-1. Major soil associations found within or near the project area for the Joint Training Exercise, Roving Sands 92, Ft. Bliss Texas.

<u>ASSOCIATION</u>	<u>SLOPE (%)</u>	<u>SOIL TYPE</u>	<u>AREAL AVERAGE (km²)</u>	<u>GRAZING/ WILDLIFE VALUE*</u>	<u>ERODIBILITY*</u>
Lozier Rock Outcrop	5-20	Gravelly loam- limestone	402.7	L-M	M-H
Blue Point-onite- wink	0-2	Loamy fine sand-loamy sand	7.6	M	S
Pintura-Tome-Dona Ana	0-5	Loamy fine calcareous sands-very fine sands	148.1	M	S
Holloman-Reeves	0-2	Very fine sandy loam- silty loam	6.1	L	M
Tome silt loam	0-5	Calcareous silty loam	165.9	M	H
Dona Ana-Berino	0-5	Fine sandy loam	8.8	L-M	L
Philder	0-9	Very fine sandy loam	202.0	M-H	L-M
Reyab-Armesa	0-2	Very fine sandy loam- loam	77.9	M-H	L-M
Jerag-Philder	0-2	Very fine sandy loam	11.1	L-H	L
Tencee	0-10	Very gravelly silt loam	11.5	L	L-M
Armesa	0-5	Very fine sandy loam	55.8	M-H	H
Eotor-Rock outcrop	20.50	Gravelly loam- limestone bedrock	109.6	M	M-H
Pena-Cale-Kerrick	0-2	Silty clay loam-silt loam	3.4	M	L-M
Deama Rock outcrop	20-50	Very gravelly loam- limestone bedrock	8.5	L-M	M

Table 3-1 (cont'd.)

Espey-Shanta variant	0-2	Silty loam-loam	0.8	L-M	L
Philder-Armesa	0-5	Very fine sandy loam	110.0	M	L
Reakor-Tome-Tencee	0-2	Silt loam-very gravelly sandy loam	6.3	M	L-M
Pintura-Dona Ana- Hueco-Wink	0-5	Loamy fine sand-sandy loam	340.2	L-M	L-M
Mimbres-Tome	0-2	Silt loam	431.0	M	L-M
Limestone Rockland- Lozier	20-65	Very gravelly loam- limestone bedrock	365.5	L-M	H
Nickel-Tencee- Simona	40-60	Gravelly very fine sandy loam-very gravelly silt loam	261.7	L-M	M

*L Low
M Moderate
H High
S Severe

Source: Jaco, 1971 and USDA, 1981.

sulfate, and nitrate concentrations are below state and Federal standards, as presented in Table 3-2.

Table 3-2. Comparison of selected water quality parameters in Hueco Bolson to State and Federal standards.

<u>Parameter</u>	<u>Concentration (ppm)</u>	
	<u>Hueco Bolson</u>	<u>Standard¹</u>
Chloride	105	300
Nitrate	7	10
Sulfate	67	300
Total dissolved solids	598	1000

¹Drinking water standard

Source: El Paso Water Utilities, 1990

Runoff from precipitation percolating through the alluvial deposits at the base of surrounding mountains provides most of the recharge for groundwater. Local ground water recharge is limited to depressional areas that penetrate the indurated caliche underlying much of the area at a shallow depth. However, only minimal recharge occurs relative to withdrawal; thus, the freshwater layer of the Hueco Bolson is gradually being depleted. The annual effective recharge to the Hueco Bolson was calculated to be about 6,000 acre-feet per year (Meyer 1976). Water supplied to Ft. Bliss by El Paso Water Utilities and pumpage from military wells averaged 2.30 billion gallons (7,059 acre-feet) per year during 1980-1990. The average rate in 1991 of water level decline in Hueco Bolson wells was 0.25-5.0 feet. Decline in the water table over the past 88 years (1903-1991) ranged from five to 145 feet. Meyer (1976) estimated that the consolidated deposits of freshwater in the Hueco Bolson contained 10.663 million acre-feet and would decrease to 9.842 million acre-feet in 1991. Balliew (1992) corroborated Meyer's estimate with the statement that the amount of storage in the Hueco Bolson for 1990 was between 9.5 and 10.0 million acre feet.

The Rio Grande and Lake Lucero are the only significant surface water bodies in the area. The Rio Grande provides water for municipal and industrial use in the area, including approximately six billion gallons per year withdrawn by El Paso. Various water sources in the Organ Mountains include small streams, seeps, springs, and pools. Although the quantity and quality of these mountain water sources are inadequate for domestic water supply they provide an important source of water for desert wildlife and support a rich variety of mesic vegetation. Surface water sources have been developed in the northeastern portion of Ft. Bliss to maintain cattle grazing operations and wildlife management programs. The Army controls the water rights to 50,000

gallons per day and 60,000 gallons per day from Carrizo Springs and the Sacramento River, respectively. This water is distributed through pipelines throughout grazing units on Otero Mesa to wildlife and stock water tanks. It is the only source of water in the area for wildlife and livestock during the dry season (U.S. Army 1984b, BLM 1990). Water location and amount are critical factors in the distribution, maintenance, and development of suitable habitat for wildlife and livestock on the mesa. Daily maintenance of the water pipeline system is essential to the 3,500 animal units grazing under 9-month contracts covering 14 grazing units on Otero Mesa. Funds generated from these contracts provide the means to maintain 90 miles of water pipeline, 20 storages, 75 water troughs, and 30 earthen reservoirs which provide year-round water for wildlife. Mitigative measures for ongoing missions at Ft. Bliss have included rehabilitation and maintenance of the earthen stock tanks to reduce seepage losses.

AIR QUALITY

The exercise area is within the interstate air quality control Region 153, El Paso-Las Cruces-Alamogordo (New Mexico Environment Department 1990). Air sampling and analysis over much of this region has not been conducted on a continuing basis because much of the area is unpopulated and remote from man-made pollution. Current data indicate that El Paso County and adjacent ranges on Ft. Bliss are non-attainment for ozone with a classification as serious. A portion of El Paso county, including Ft. Bliss, is in non-attainment for carbon monoxide and for inhalable particulate matter (PM₁₀) with a classification as moderate. High wind speeds in the desert environment and associated dust storms may cause blowing dust from naturally exposed areas; therefore, high levels of particulate matter would be expected even in the absence of developed areas. Exceedances of particulate matter occur most frequently during the winter months and most occur during periods with little air exchange. Based on the average rainfall, it is estimated that there are 10 days per year when the ground is damp enough to inhibit dust generation from vehicles traveling unpaved roads on Ft. Bliss (Texas Air Control Board 1991).

Ft. Bliss is in a designated Prevention of Significant Deterioration (PSD) area for sulphur dioxide and nitrogen oxides. The purpose of the PSD program, required by the Federal Clean Air Act of 1970, is to assure that areas having air better than the Federal Standards continue to have clean air. New stationary sources (e.g., smokestacks) shall apply best available control technology for regulated pollutant sources.

An inventory of air pollution sources and analysis of ambient air quality (1982) at Ft. Bliss indicated that no air pollution concentrations exceeded Federal standards, except for a one-hour maximum exceedance for carbon monoxide (NMED, 1990). Monitoring was conducted for total suspended particulates, arsenic, cadmium, zinc, lead, and carbon monoxide. Table 3-3 lists the measured concentrations of pollutants in Region 153 and El Paso County compared to Federal standards.

Table 3-3. Comparison of highest concentrations of pollutants measured with Federal standards, El Paso-Las Cruces-Alamogordo Interstate Region 153 and El Paso County.

<u>Measured Concentration</u>				
Pollutant	Units	Region 153	El Paso	Federal Standard
PM ₁₀ (24 hour)	μg/m ³	53-297	52-412	150
Lead (Quarter)	μg/m ³	0.07-0.44	att.	1.5
SO ₂ (24 hour)	ppm	0.02-0.12	att.	0.14
Ozone (1 hour)	ppm	0.08-0.12	0.17	0.12
CO (1 hour)	ppm	8.0-13.0	12.6	9.0
PM ₁₀	Inhalable particulate matter			
SO ₂	Sulphur dioxide			
CO	Carbon monoxide			
μg/m ³	Micrograms per cubic meter			
ppm	Parts per million			
att.	Attainment of Federal standard			

Source: New Mexico Environment Department 1990.

AMBIENT NOISE

Sources associated with the routine activities that contribute to the general ambient noise levels outside the Ft. Bliss and WSMR installation boundaries include aircraft operations, missile and artillery firings, and ground vehicle operations. The U.S. Army Environmental Hygiene Agency (USAEHA 1976) and U.S. Army Corps of Engineers, Construction Engineering Research Laboratory (CERL) have studied noise data on Ft. Bliss and WSMR. Through the use of maximum equivalent sound level (L_{eq}) and day-night average sound level (L_{dn}) identified by the Environmental Protection Agency (EPA) as requisite for the prevention of hearing damage and annoyance, mathematical estimates of minimum distances from noise sources were derived (U.S. Army 1976).

Based on operational data and defined flight paths, CERL and USAEHA determined that there is little or no possibility of hearing damage to residents of nearby communities from aircraft activity over McGregor Range. In addition, the data indicated that no adverse reaction from communities result with regard to activity interference or annoyance when the minimum 300 feet altitude is maintained. Aircraft will be operated from existing airfields on Ft. Bliss and WSMR.

Ambient noise monitoring data indicate that the large open areas separating noise sources from the population outside the installation boundaries serve as buffer zones. Flight patterns over civilian communities and wildlife populations are the only potential problem areas. Aircraft noise is minimized by maintaining 2,000 feet minimum slant distance from installation boundaries. The L_{dn} for the entire area, over 2,600 square miles, was between 45-50 dB on an average day as compared to normal conversation which generates noise near 65 dB. Existing WSMR operational restrictions require supersonic flights to avoid populated areas, including all other sensitive areas. Supersonic flight activity and consequent sonic boom occurrences are restricted to approved airspace above 10,000 feet AGL in the northern two-thirds of WSMR. Documented activity records for this airspace indicated that a total of 591 sonic booms occurred during a six-month period (Plotkin 1989). Supersonic flights over the northern part of WSMR have caused complaints from ranchers in the area surrounding WSMR. However, data from the EPA indicate that noise impacts from operating supersonic training within WSMR is not considered severe. The average sonic boom recorded by Plotkin (1989) had a peak overpressure of 1 PSF (pounds per square foot), 99% of all sonic booms were less than 4 PSF, and none exceeded 7 PSF.

Launch and impact noise monitoring data indicate that only personnel in the immediate launch or impact areas have potential to be exposed to hazardous noise levels. Missile firing noise is attenuated such that anyone more than three miles away will not experience any significant adverse impacts. Weapons firing will be conducted on Dona Ana/Orogrande and McGregor ranges, which are approximately 20 miles north of residential areas near the main cantonment area.

BIOLOGICAL RESOURCES

McGregor Range is within the northern limits of the Chihuahuan Desert. Elevation variance of 3,900-8,600 feet MSL, topographic position, hydrology and soil factors produce the biological diversity that is characteristic of the region. McGregor Range has been divided into five ecological zones (Figure 3-2) based on topography and vegetational characteristics (USAEHA, 1975). A brief description based on the 1975 surveys is provided in the following paragraphs. Additional information is provided in Kenmotsu and Pigott (1977). Other biological resources discussed in the succeeding paragraphs include reptiles, birds, mammals, threatened and endangered species, and unique or sensitive areas.

Vegetation

The sand dune and mesquite ecozone is located within the Tularosa Valley and forms the western boundary of the range. Characteristic vegetation includes a mesquite (Prosopis glandulosa var. torreyana)-saltbush (Atriplex canescens) association on coppice sand dunes, with broom snakeweed (Gutierrezia sarothrae)-soaptree yucca (Yucca elata)-sandsage (Artemisia filifolia) populations occupying the interdune areas.

The alluvial fan-creosotebush ecozone is intermediate between the sand dune and foothills zones on the alluvial fans of the Hueco and Sacramento Mountains and the alluvial fans below Otero Mesa. Creosotebush (Larrea tridentata) is dominant on the gravelly alluvial soil throughout most of the zone, and tarbush (Flourensia cernua) is prominent on fine-textured soils of the bottomlands. Grasses are lacking over much of the zone; consequently, the soils have been severely eroded.

The foothills and draws-yucca grassland ecozone lies within the large draws of the Hueco Mountains and on the undulating lands below the Otero Mesa escarpment. This zone is intermediate between the alluvial fan-creosote bush and the mesa-grassland ecozones. Species diversity is high; xeric grasses and shrubs dominate the slopes and ridges while more mesic species occur along the ephemeral drainages. Creosotebush is dominant among shrub species that include ocotillo (Fouquieria splendens), Spanish sword (Yucca torreyi), allthorn (Koeberlinia spinosa), and Mormon tea (Ephedra trifurca). Grass cover may be significant along the arroyo terraces, but is rarely dominant on the slopes. Grama grasses (Bouteloua spp.), bush muhly (Muhlenbergia porteri), dropseeds (Sporobolus spp.), threeawns (Aristida spp.), tobosa grass (Hilaria mutica), and vine mesquite (Panicum obtusum) occupy most of the terraces and slopes.

The mesa-grassland ecozone occurs on the Otero Mesa and forms the eastern boundary of the range. The expansive grassland stands in sharp contrast to the nearby and adjacent xeric shrubland on the valley floor. Grama grasses, dropseeds, and vine mesquite are predominant. Shrub communities are scattered and include species such as mesquite, creosotebush, soaptree yucca, broom snakeweed, saltbush, and apache plume (Fallugia paradoxa) that occur in the gravelly alluvial soils.

The mountains canyon-pinyon-juniper ecozone occurs in the Organ and Sacramento Mountains generally below 6,000 feet MSL.

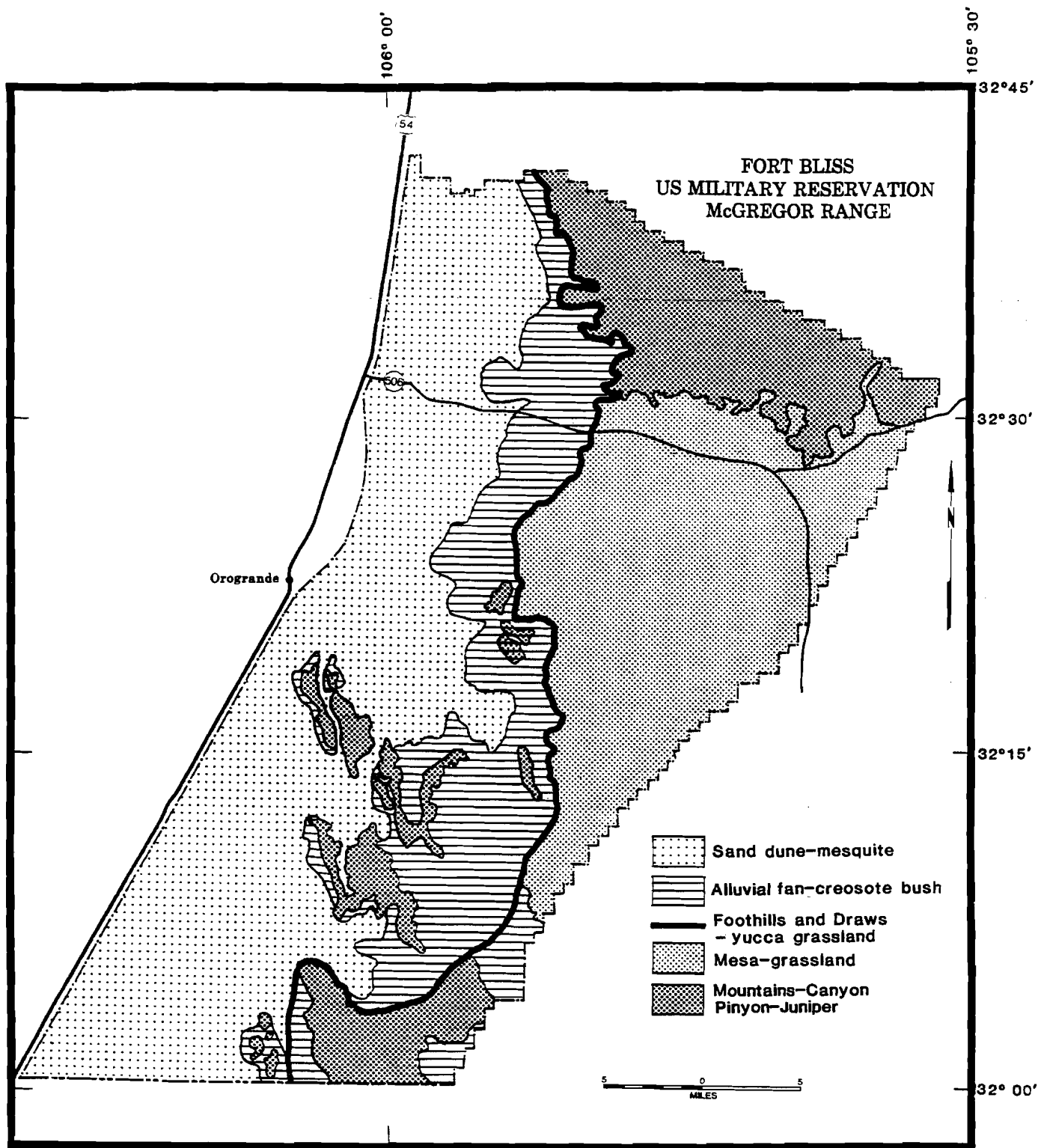


Figure 3-2. Ecological zones on Fort Bliss McGregor Range.

Wavy leaf oak (Quercus undulata), sotol (Dasyllirion wheeleri), mountain mahogany (Cercocarpus montanum), agave (Agave parryi), and sumac (Rhus spp.) are common, in addition to pinyon pine (Pinus edulis) and juniper (Juniperus spp.). Ponderosa pine (P. ponderosa) exist on the highest elevations of the Sacramento Mountains. Stands of grama grasses, plains bristlegrass (Setaria macrostachya) and bush muhly occur in intra-montane meadows. Common shrubs are mountain mahogany, red barberry (Berberis haematocarpa), cane cholla (Opuntia imbricata), and yuccas (Yucca spp.).

Exercise sites for RS-92 on McGregor Range are within the mesa-grassland, alluvial fan-creosotebush, and sand dune-mesquite ecozones. The vegetation association over the mesa areas is largely homogeneous; mixed and pure stands of grasses predominate. The soil-vegetation is relatively stable over an impermeable caliche layer that occurs at shallow depths. On Otero Mesa, isolated stands of soaptree yucca occur in association with dropseeds and grama grasses. The mesquite-stabilized sand dune area is dominated by the mesquite-saltbush-broom snakeweed association. The soils are subject to severe erosion and constant dune movement.

Site Specific Vegetation

Surveys for selected protected, threatened and endangered species (Appendix A, Table A1, A2) were conducted on sites proposed for HAWK/SHORAD (H/S) training and Patriot missile defense. The purposes of these surveys were three-fold: (1) to determine the vegetational species composition at each site, (2) to establish long-term monitoring plots, and (3) to document the presence/absence of threatened or endangered species. Five H/S sites and 16 Patriot sites have been intensively surveyed. Specific locations of surveyed sites are presented in Table 3-4.

Prior to conducting the surveys, project personnel reviewed taxonomic literature including species status reports and examined herbarium specimens of listed protected plants and commonly occurring species in the exercise area. All members of the field team developed a clear search image of the target species prior to initiating field surveys. Because of the uncertainties of plant phenology, survey bias, drought tolerance, and annual variability, this survey could not necessarily deny a species occurrence but only confirm it.

Study sites were located with a Global Positioning System Device (GPS) and boundaries were delineated using a hand-held compass and pacing. Boundaries were parallel to military grid coordinate lines on topographic maps provided by Ft. Bliss. H/S sites were 348-m square (30 acres) and Patriot sites were 1000-m square (1 km² or 247 acres). A team of professional biologists walked abreast meandering along north-south transect lines at 25-30 meter intervals (Figure 3-3). The systematic transects divided sites into manageable units to allow the most complete coverage with the least possible duplication.

All of the H/S sites are within the Tularosa Basin on alluvial fan-creosotebush ecozone and bordering the sand dune-mesquite ecozone. All but 3 of the sites proposed for positioning Patriot missile defense units are within Otero Mesa on the mixed grassland

Table 3-4. Sites surveyed for use during the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas.

Site	UTM Coordinates ¹	Comments
HAWK/SHORAD (30-acre)		
H/S 1	40965/35870	Alluvial fan-creosotebush
H/S 2	40650/35800	Alluvial fan-creosotebush
H/S 3	40500/35900	Abandoned due to archaeology and biology
H/S 4	41065/35914	Alluvial fan-creosotebush
H/S 5	40665/35850	Alluvial fan-creosotebush, avoid flagged Scheer's pincushion cactus
H/S 6	41300/35970	Alluvial fan-creosotebush
Patriot (1 km²)		
P 1	40900/35100	Abandoned due to archaeology and biology
P 2	42932/35850	Mesa grassland, avoid flagged grama grass cactus
P 3	42600/35770	Mesa grassland
P 4	43300/35832	Mesa grassland
P 5	43900/35841	Mesa grassland
P 6	42238/35686	Mesa grassland
P 7	44200/35890	Abandoned due to archaeology and biology
P 8	42530/35720	Mesa grassland
P 9	43310/35770	Mesa grassland
P 10	42155/35790	Mesa grassland
P 12	43082/35710	Mesa grassland
P 14	43900/35870	Mesa grassland
P 17	40810/35743	Alluvial fan-creosotebush
P 19	38620/35501	Sand dune-mesquite
P 20	42600/35866	Mesa grassland
P 21	42365/35935	Mesa grassland
P 22	40830/35796	Alluvial fan-creosotebush
P 23	43650/35908	Mesa grassland

¹SW corner of site.

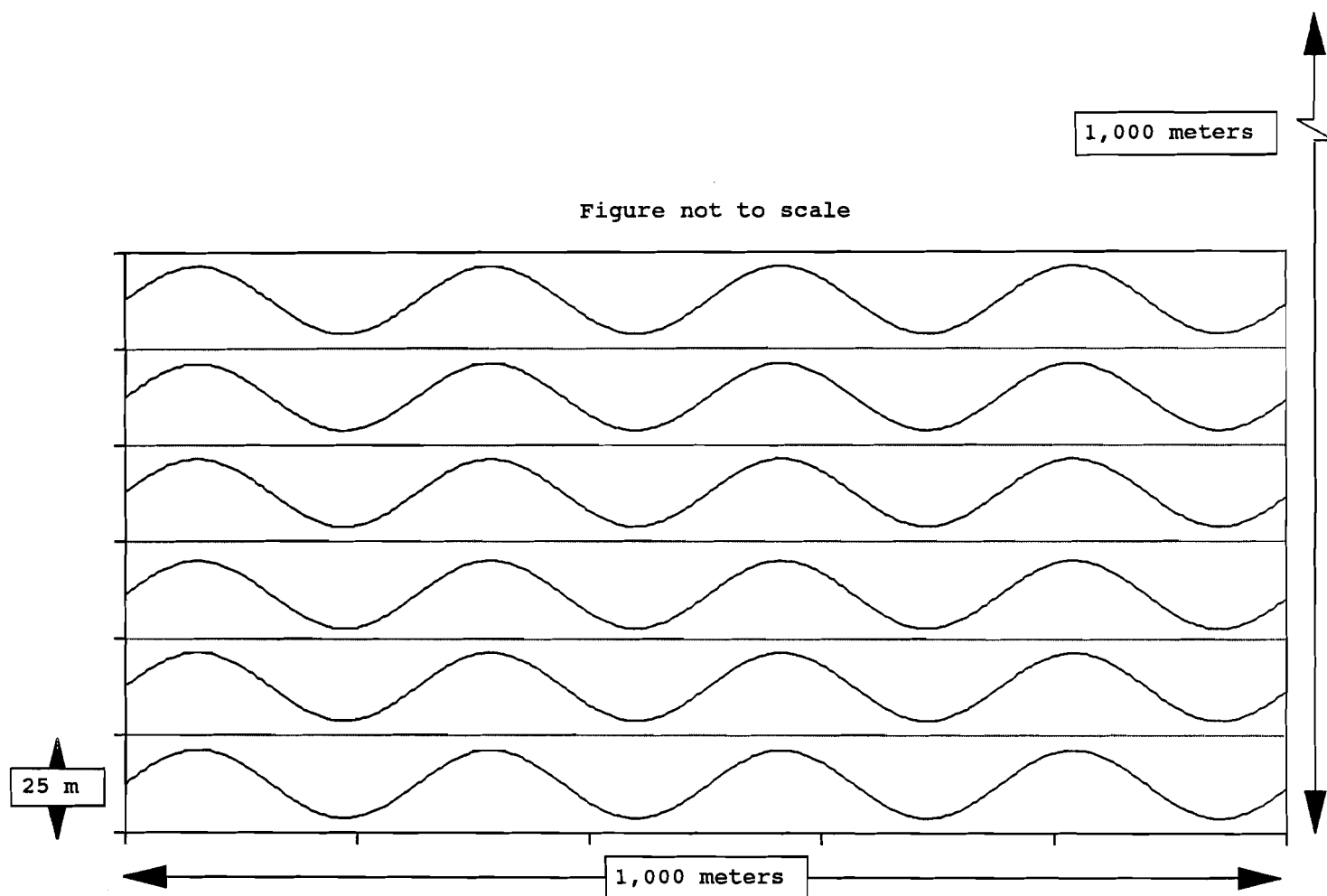


Figure 3-3. Illustration of the procedure used to survey 1-km square sites for the occurrence of threatened and endangered species. Fort Bliss, Texas.

ecozone. Common plants are presented in (Appendix A, Table A3). The distribution of sites within McGregor Range is presented in Figure 3-4. Proposed sites will not be used for training unless they are found to be without state and Federal threatened or endangered plant species (including sensitive and candidate species), or the area surrounding listed species can be marked with flagging to allow use without adverse impacts.

Designated exercise sites on WSMR are presented in Figure 3-5. A list of the areas indicating their accessibility and exclusions is included in Appendix B.

Reptiles

Reptiles are the most abundant and diverse group of vertebrate animals in the Chihuahuan Desert, which contains McGregor Range. Characteristic lizards include greater earless (Cophosaurus texanus), round-tail horned (Phrynosoma modestum), whiptails (Cnemidophorus spp.), and spiny lizards (Sceloporus spp.). Common snakes of the area include whipsnakes (Masticophis taeniatus and M. flagellum testaceus), ratsnakes (Elaphe spp.), and rattlesnakes (Crotalus atrox, C. molossus, and C. viridis).

Birds

The bird fauna of the project area is typical of the Chihuahuan Desert and its associated montane habitat. Although the desert supports a diverse group of birds, only the scaled quail and white-necked raven are considered characteristic species and both commonly extend their range outside the desert (Brown 1982). Hubbard (1970) reported that 344 (72%) of the 476 bird species that occur in New Mexico occur in and around the exercise area. Common species include mourning dove, roadrunner, lesser nighthawk, Scott's oriole, cactus wren, crissal thrasher, black-throated sparrow, horned lark, western meadowlark, turkey vulture, American kestrel, red-tailed hawk, and northern harrier.

Mammals

Hall (1981) reported over 140 species of native mammals in New Mexico and more than 100 of these may occur within and surrounding the project area. At least five species have been introduced by man, including house mouse (Mus musculus), Norway rat (Rattus norvegicus), horse (Equus caballus), barbaray sheep (Ammotragus lervia), and gemsbok (Oryx gazella). The latter two species were introduced by the New Mexico Department of Game and Fish in the late 1960s. The remaining species represent approximately 70% of the native mammals in New Mexico.

Non-game mammals, mostly small rodents, comprise a large basis of the food supply for the larger carnivorous mammals. Common rodents include spotted ground and rock squirrels (Spermophilus spilosoma and S. variegatus), plains and desert pocket mice (Perognathus flavescens and P. penicillatus), kangaroo rats (Dipodomys spp.), and several species of mice (Peromyscus spp.).

Common insectivorous mammals include California myotis (Myotis californicus), hoary bat (Lasiurus cinereus), Brazilian free-tailed bat (Tadarida brasiliensis mexicana), pallid bat (Antrozous pallidus), and Townsend's big-eared bat (Plecotus townsendii pallescens).

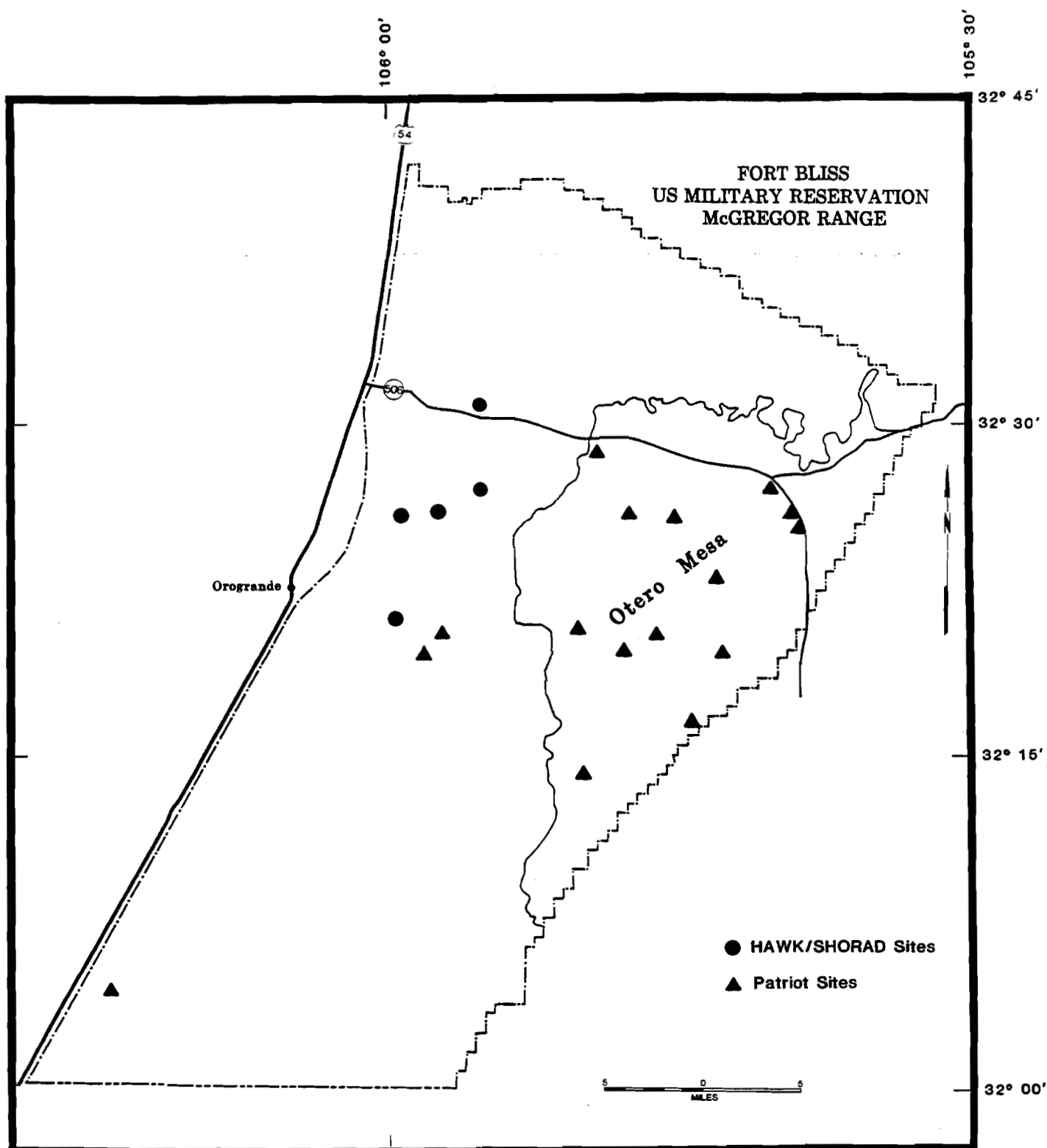
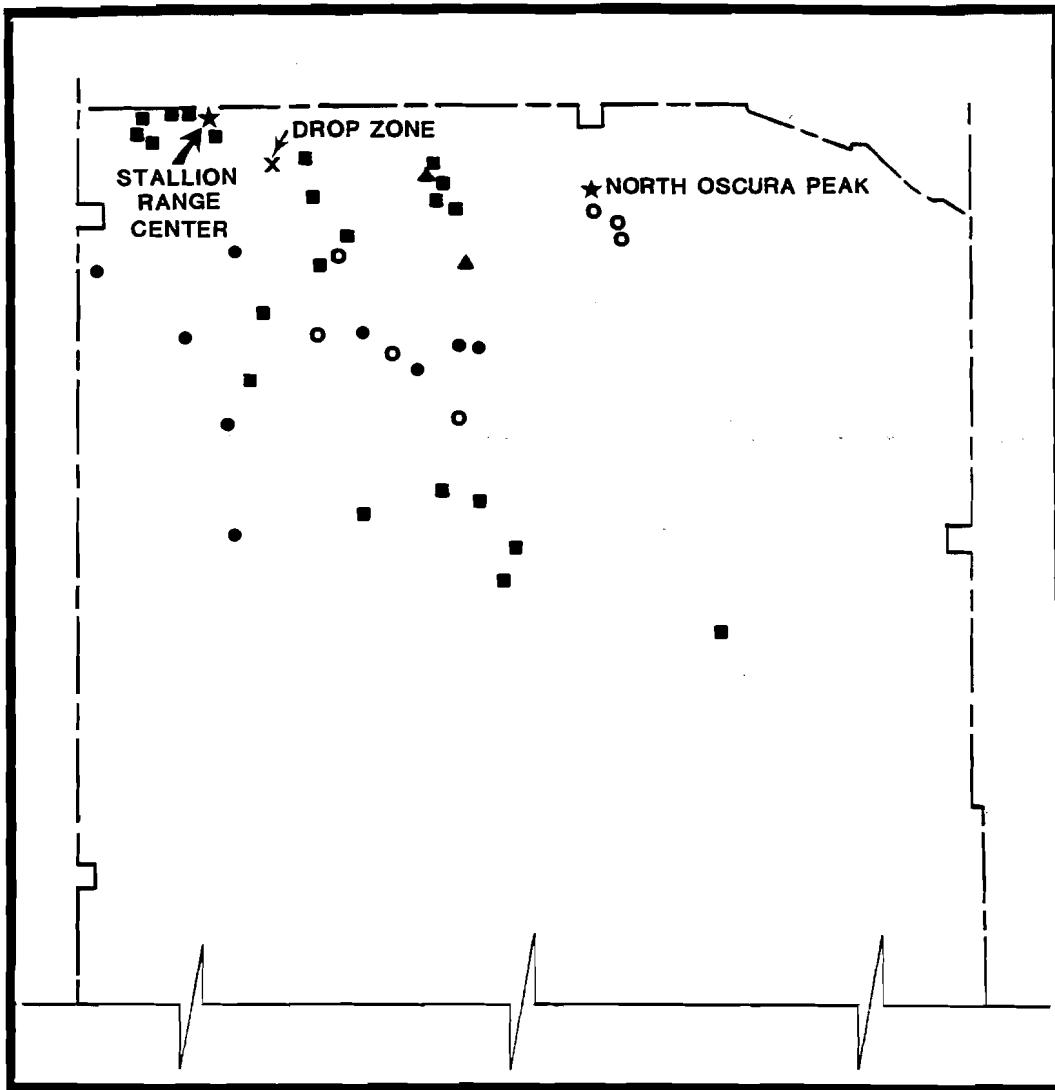


Figure 3-4 Distribution of exercise sites for the JTX, RS 92.



LEGEND

- 40 Acre Site
- 30 Acre Site
- ▲ 10 Acre Site
- 5 Acre Site

LOCATION MAP

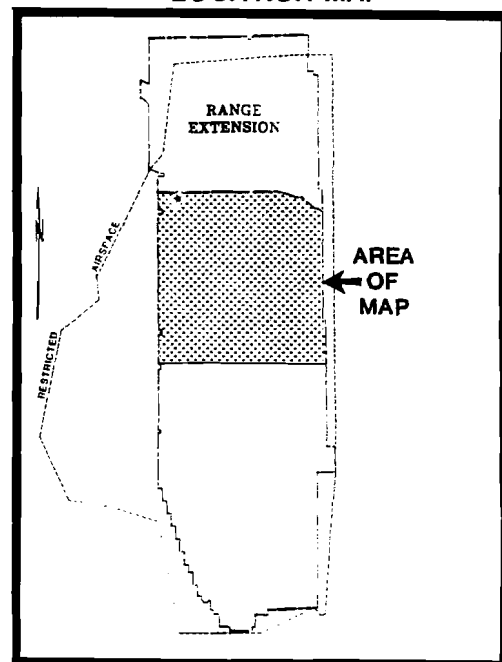


Figure 3-5. Exercise sites on White Sands Missile Range for the JTX, RS 92.

Common predators in the project area include bobcat (Lynx rufus), gray fox (Urocyon cinereoargenteus), coyote (Canis latrans), and mountain lion (Felis concolor). Other mammalian predators commonly found in the area include badger (Taxidea taxus) and striped skunk (Mephitis mephitis).

Common big game mammals include mule deer (Odocoileus hemionus), pronghorn (Antilocapra americana), gemsbok, and barbary sheep. Permitted hunts are provided within special hunt areas.

Threatened, Endangered, and Protected Species

Requests for information concerning protected species were made to the U.S. Fish and Wildlife Service (USFWS), Texas Parks and Wildlife Department (TPWD) and New Mexico Department of Game and Fish (NMDGF). Copies of these requests and the responses received are in Appendix C. Protected species permits (Scientific Collector's Permit) were obtained from TPWD and NMDGF prior to conducting field surveys. The following paragraphs describe the species that were identified by these agencies as possibly occurring within or near the exercise area. References are taken from Hubbard et al. (1979) and New Mexico Native Plants Protection Advisory Committee (1984).

Plants

Alamo beardtongue (Penstemon alamoensis) is expected to occur in Dona Ana and Otero counties, New Mexico and adjacent Texas. It was listed in the Federal Register on 15 December 1980 as a Federal candidate under review for listing and endangered in New Mexico. The beardtongue's habitat is canyon bottoms, crevices, and pockets in rocky limestone hillsides at about 5,000 feet MSL. Overgrazing by wildlife and livestock and collection are threats to this species.

Grama grass cactus (Toumeyia papyracantha) is expected to occur in Bernalillo, Cibola, Dona Ana, Grant, Los Alamos, Otero, Rio Arriba, Sandoval, Santa Fe, Socorro, Torrance, and Valencia counties, New Mexico, and adjacent Arizona and Texas. It was state listed on 15 December 1980 as endangered in New Mexico (sensitive in Texas) and as a Federal candidate (C2). Its habitat is grama grass (Bouteloua spp.) and galleta (Hilaria jamesii) grasslands at about 5,000-7,300 feet MSL, usually where soil is sandy, and rarely on gypsiferous soils. Occurrence of this species on McGregor Range was documented in 1990 (U.S. Army, 1991). Overgrazing, collection, and destruction of habitat by urbanization are threats to this species.

Gypsum scalebroom (Lepidospartum burgessii) is expected to occur in Otero County, New Mexico and adjacent Texas. It was also state listed on 15 December 1980 as endangered in New Mexico (sensitive in Texas) and as a Federal candidate (C2). Its habitat includes gypsiferous ridges and flats at about 4,000 feet MSL. It was first described in 1977 and said to be rare in Texas. It was discovered in New Mexico in 1982 and was found abundant within a few small alkaline playas. Threats to this species are unknown.

The known distribution of Kuenzler's hedgehog cactus (Echinocerus fendleri var. kuenzleri) is in Eddy, Otero, and Lincoln counties, New Mexico. It was Federally listed on 26 October 1979 as endangered in New Mexico. Habitat is limestone

ledges, rock cracks, and gentle slopes in or just below juniper woodlands at about 6,000 feet MSL. This is the rarest known cactus in New Mexico and has been collected to near extinction.

Occurrence of Todsen's pennyroyal (Hedeoma todsenii) has been confirmed in Sierra and Otero counties, New Mexico where it was Federally listed on 25 July 1980 as endangered. Habitat is north- and east-facing slopes of 45 degrees or greater in gravelly gypsiferous limestone soil at about 6,600 feet MSL. Todsen's pennyroyal is usually found in association with or under scattered pinyon (Pinus edulis). The poor reproductive potential of this species represents a significant threat to its survival.

Sneed's pincushion cactus (Coryphantha sneedii var sneedii) is known to occur in Dona Ana and Eddy counties, New Mexico and El Paso County, Texas. It was Federally listed on 7 November 1979 as endangered in New Mexico and state listed S2 (rare and very vulnerable to extirpation) in Texas. Habitat is rocky slopes of limestone mountains at 4,000-6,000 feet MSL. Collection is the major threat to this species.

Grayish white giant hyssop (Agastache cana) is expected to occur in Bernalillo, Dona Ana, Grant, Lincoln, and Otero counties, New Mexico and adjacent Texas. It is state listed as a sensitive species in New Mexico. The hyssop's habitat is mountains of western Texas and southern New Mexico at 5,250-6,225 feet MSL. The threats to this species are unknown at this time.

Spoonleaf rabbitbrush (Chrysothamnus spathulatus) is expected to occur in Eddy, Otero, Sierra, and Socorro counties, New Mexico and in the Guadalupe Mountains of adjacent Texas. It is state listed as a sensitive species in New Mexico and S2 in Texas. The pinyon-juniper (Juniperus spp.) zone and lower foothills (at 4,400-7,000 feet MSL) are the preferred habitat of this species. There are no known threats to this species and it may be more common than surveys indicate.

Scheer's pincushion cactus (Coryphantha scheeri) occurs on WSMR and Dona Ana, Eddy, Hidalgo, Luna, and Sierra counties, New Mexico. It was state listed as endangered in 1985. It occurs on open flats and plains, often in alluvial soils at 3,000-5,000 feet MSL. Over-collection is the major threat to this species.

The night blooming cereus (Cereus gregii) occurs on WSMR and Dona Ana, Grant, Hidalgo, and Luna Counties, New Mexico and adjacent Arizona, Texas, and Mexico. It was state listed as endangered in Texas and New Mexico in 1985 and a Federal candidate (C2). It occurs in gravelly or silty areas in washes or flats at 3,000-5,000 feet MSL. Collection has decimated local populations and over-grazing probably also has contributed to losses.

Wright's fishhook cactus (Mammillaria wrightii) occurs on WSMR and Bernalillo, Catron, Dona Ana, Guadalupe, Lincoln, McKinley, Sandoval, Santa Fe, Socorro, Torrance and Valencia counties, New Mexico and adjacent Texas and Arizona. It was state listed as endangered in New Mexico in 1985. It occurs on gravelly hills or sandy hills or plains, desert grassland to pinyon-juniper at 3,000-7,000 feet MSL. Local populations are declining due to over-collection and habitat alteration.

Sandberg's pincushion cactus (Coryphantha sandbergii) occurs on WSMR and Dona Ana and Sierra counties New Mexico. It was state listed as endangered in 1985. Its habitat is entirely within the

San Adres Mountains on rocky hillsides at 6,000-7,500 feet MSL. The limited distribution of this species and inadvertent habitat destruction are threats.

Sand prickly pear (Opuntia arenaria) occurs in Dona Ana County, New Mexico and El Paso and Hudspeth counties, Texas. It is state listed as threatened in New Mexico S2 in Texas. It was listed as a candidate (C2) for Federal protection in 1980. Its habitat is on and among sandy dunes or on sandy floodplains in arroyos at 3,600 feet MSL. Urban development and overcollection by cactus poachers are threats.

Dense pincushion cactus (Coryphantha dasyacantha var. dasyacantha) ranges in Texas and New Mexico. It is a candidate (C2) for Federal protection and is state listed S2 in Texas. Its habitat is rocky slopes at 3,000-4,500 feet MSL. Threats to this species are unknown.

Comal snakewood (Colubrina stricta) occurs in El Paso County and adjacent counties in Texas. It is a candidate (C2) for Federal protection and is state listed as especially vulnerable to extirpation (S1) in Texas. This species is very rare and little is known regarding its habitat and threats to the species.

Sand sacahuista (Nolina arenicola) occurs in El Paso, Culberson, and Hudspeth counties Texas and adjacent New Mexico. It is a candidate (C2) for Federal protection and is state listed S2 in Texas. Its habitat is sandy soils in chaparral and brushlands, and on dunes. Threats to this species are unknown.

Plank's catchfly (Silene plankii) occurs in Bernalillo, Dona Ana, Sandoval, Sierra, and Socorro counties, New Mexico and in the Franklin Mountains of extreme west Texas. It is listed as S1 in Texas and New Mexico and was listed as a Federal candidate (C2) in 1980. It occurs in crevices and pockets in protected cliff faces of igneous rock and moss covered ledges in the Franklin Mountains at 5,000-6,500 feet MSL. Threats to this species include limited habitat.

Mountain sage (Salvia summa) occurs in Dona Ana and Eddy counties, New Mexico and in the Guadalupe Mountains of extreme west Texas. It is listed S2 in New Mexico and Texas. It occurs on shaded rock ledges and rock cracks on steep limestone canyon sides at 5,000 feet MSL. Threats to this species are unknown.

Wheeler spurge (Chamaesyce geyeri var. wheeleriana) is rare and endemic in the eastern part of El Paso County, Texas. It is listed S1 and occurs locally in dune areas. Threats to this species are unknown.

Resin-leaved brickellbush (Brickellia baccharidea) is known to occur in Texas (only in the Franklin Mountains, El Paso County). It is listed as S1 in Texas. This species also occurs in northern New Mexico on rocky slopes at 5,000-6,000 feet MSL. Threats to this species are unknown.

Hueco Mountain rock daisy (Perityle huecoensis) is known only from the type locality, Hueco Tanks area in El Paso County, Texas. It is a Federal candidate (C2) and is listed S1 in Texas. The limited distribution of this species is the greatest threat.

Button cactus (Epithelantha micromeris) occurs in Otero, Dona Ana, and adjacent counties in southern New Mexico and adjacent Texas. It is listed as state endangered in New Mexico. Its

habitat is on exposed ridges and hillsides and in riverbeds. It is threatened by collection.

Woven-spine pineapple cactus (Neolloydia intetexta) occurs in Otero, Dona Ana, and adjacent counties in southern New Mexico, and in Texas, Arizona, and Mexico. It is listed as state endangered in New Mexico. Its habitat is grasslands and on limestone hills at 4000-5000 feet MSL. It is threatened by collection.

Payson's hiddenflower (Cryptantha paysonii) occurs in Otero, Sierra and adjacent counties in southern New Mexico and in adjacent Texas. It is listed as state sensitive in New Mexico. Its habitat is open slopes on limestone soils at 4000-7000 feet MSL. Threats to this species are unknown.

Gypsum blazing star (Mentzelia perennis) occurs in Otero County and adjacent counties in central New Mexico. It is listed as state sensitive in New Mexico. Its habitat is gypsum deposits and limestone hills in the lower juniper vegetation type at 5400 feet MSL. Threats to this species are unknown.

Perityle staurophylla var. staurophylla occurs in Dona Ana, Otero, and Sierra counties, New Mexico. It is listed as state sensitive in New Mexico. Its habitat is crevices in limestone cliffs and boulders, usually on protected north and east exposure at about 7000 feet MSL. Threats to this species are unknown.

Dune unicorn plant (Proboscidea sabulosa) occurs in Eddy, Lea, and Socorro counties, New Mexico and adjacent Texas. It is listed as state sensitive in New Mexico. Its habitat is deep sands of mostly stabilized dunes, desert scrubs, often with mesquite at about 3500 feet MSL. Threats to this species are unknown.

Gray sibara (Sibara grisea) occurs in Otero county, New Mexico and possibly adjacent Texas. It is listed as state sensitive in New Mexico. Its habitat is on and at the base of limestone cliffs at 4500-6000 feet MSL. Threats to this species are unknown.

Texas tobacco root (Valeriana texana) occurs in Eddy and Otero counties, New Mexico and in adjacent Texas. It is listed as state sensitive in New Mexico. Its habitat is shaded, moist limestone rock faces, occasionally in canyon bottoms at 6000-8000 feet MSL. Threats to this species are unknown.

Animals

Common black hawk (Buteogallus anthracinus) is an uncommon summer resident and migrant through Otero and Dona Ana counties, New Mexico and a historic resident on McGregor Range. It occurs from Arizona to southern Texas and southward to Peru and Paraguay. It was listed on 22 July 1983 as endangered-group 2 (species survival or recruitment likely to become jeopardized in the foreseeable future) in New Mexico and threatened in Texas. Habitat is mainly found in cottonwood (Populus spp.) and woodlands around streams. Key habitats in New Mexico include lower elevations in the Gila, San Francisco, and Mimbres Rivers drainages. Loss of riparian habitat and persecution are serious threats to this species.

The ferruginous hawk (Buteo regalis) has been sighted throughout the year as a casual species in Otero County and McGregor Range. It has been sighted most recently at Biggs AAF in 1990. Its range covers the western half of the United States in open dry grasslands. It is currently a Federal candidate species

under review for listing. Habitat loss and persecution are threats to this species.

Elegant trogon (Trogon elegans) is expected to occur on Ft. Bliss, probably as a casual summer resident. It has been observed feeding in Otero County, New Mexico. It was listed on 22 July 1983 in New Mexico as endangered-group 1 (vulnerable to extinction). It occurs primarily in mountains of southeast Arizona and in the lower Rio Grande Valley, Texas. In New Mexico, the elegant trogon is largely a vagrant in the southwestern part of the state. The trogon's preferred habitat is lower canyons, primarily in Arizona, which support communities of sycamore (Platanus wrightii), live oaks (Quercus spp.) and pines (Pinus spp.). Habitat loss is the major threat to this species.

The gray vireo (Vireo vicinior) is a resident in El Paso County and casually found in Dona Ana and Otero counties, New Mexico. It was sighted on McGregor Range and Ft. Bliss in 1989 (U.S. Army, 1991). It was listed on 22 July 1983 in New Mexico as endangered-group 2. The species ranges from southern California to western Oklahoma, and southward to northern Baja California, southern Arizona, southern New Mexico, western Texas, and northern Coahuila. The vireo is found in a variety of habitats, including dry brush of mountains and mesas, although it prefers dense shrubland or woodland along lowland stream courses. Key habitat areas are in Hidalgo and Eddy counties, New Mexico. Nest parasitism by the brown-headed cowbird (Molothrus ater) and loss of riparian habitat are the primary threats to this species.

Long-billed curlew (Numenius americanus) have been casually sighted in Otero County on McGregor Range. The curlew appears along the eastern seaboard of South Carolina to Florida; however, it primarily ranges throughout most of the western United States near shallow ponds on lakes contained by prairie grasslands. It is currently a Federal candidate species under review for listing. Drainage of the prairie lakes and over-plowing are considered the main threats to this species.

The Mississippi kite (Ictinia mississippiensis) is expected to occur on Ft. Bliss and McGregor Range as a migrant of Otero and Dona Ana counties. It ranges from southeastern Colorado and Kansas, eastward through southern Illinois and the Carolinas, and southward to the southwestern and Gulf Coast states to South America. This species now summers regularly and breeds in the Clovis region and apparently in Roswell and Hobbs. It was listed on 22 July 1983 in New Mexico as endangered-group 2. The kite's preferred habitat is open prairies and forests. One Mississippi kite was observed during a recent reconnaissance (December 1991) on the Otero Mesa. Loss of riparian habitat and persecution are threats to this species.

Mountain plover (Charadrius montanus) has been sighted in Otero County, New Mexico on McGregor Range. It occurs throughout most of the western United States particularly in high plains and semi-desert regions. It is currently a Federal candidate species under review for potential listing. Habitat loss is the main threat to this species.

Northern aplomado falcon (Falco femoralis septentrionalis) is a historic species for Ft. Bliss and is now classified as extirpated due to habitat modification. The last verified nest was

found in 1952 in Deming, New Mexico. However, one juvenile falcon was sighted near Tularosa, New Mexico during the summer of 1991. The falcon stayed in the area for approximately six weeks. The aplomado falcon was believed to migrate through El Paso County, Texas and Otero, Dona Ana and neighboring counties, New Mexico. It is Federally listed as endangered and is rare along the Mexican border which would make the Otero Mesa of McGregor Range a potential reintroduction site for this species. The falcon's preferred habitat is open rangeland covered with tropical savannah. Shooting, human disturbance at nest sites, loss of nesting trees and pollution of food are significant threats to this species.

Least terns (Sterna antillarum) nest at the Bitter Lake National Wildlife Refuge and generally in the vicinity of Roswell. These are the only nesting least terns left in New Mexico. Least terns breed from California, South Dakota, and Maine southward to Chiapas and the Caribbean, with the major inland population in the Mississippi Basin. The species occurs during migration in Eddy County and as a vagrant elsewhere. It was listed on 25 May 1979 in New Mexico as endangered-group 2 and Federally listed as endangered on 28 May 1985. Loss of adequate nesting habitat, predation, and human disturbance are the major threats to this species.

Olivaceous cormorants (Phalacrocorax olivaceus) may occur on Ft. Bliss and have been casually seen in Dona Ana and Otero counties, New Mexico. The cormorant occurs from southern New Mexico to southern Louisiana, southward through Central America and parts of the Caribbean region to southern South America. In New Mexico, this species occurs in the Rio Grande Valley at Elephant Butte and Caballo Lakes, Bosque del Apache National Wildlife Refuge, northward to the Bernalillo area, and southward to Las Cruces. This species also occurs occasionally in the Gila River valley to southern Hidalgo County, and in the lower Pecos River valley. It was listed on 22 July 1983 in New Mexico as endangered-group 2. The cormorant's habitat is larger bodies of water such as reservoirs. Low numbers, limited availability of nesting sites, persecution as fish-eaters, and fluctuation in food supply are threats to this species.

The peregrine falcon (Falco peregrinus) is a resident of Otero County, New Mexico and was most recently sighted on Ft. Bliss in 1989 (U.S. Army, 1991). The species occurs throughout much of North America, and in South America, Eurasia, Australia, Africa, and Oceania. It is frequently cited as the most widely distributed bird in the world. The peregrine falcon was Federally listed on 20 January 1970 as endangered throughout its range in the United States. Key areas include the breeding territories which center on cliffs that are in wooded/forested habitats over-looking rivers and lakes. Loss of suitable habitat, disturbance, and pesticide contamination in the prey base are threats to this species.

Snowy plovers (Charadrius alexandrinus) are migratory from the Pacific coast into the western United States. Snowy plovers have been sighted in Otero County on McGregor Range and breed from central California, northern Utah, and southern Kansas south to northern lower California and southern Texas. It currently is a Federal candidate species under review for listing. Habitat includes broad expanses of dry sand flats and alkali ponds. Loss of habitat is the main threat to this species.

Varied bunting (Passerina versicolor) is expected to occur on McGregor Range and is casually found in Otero County. The species ranges from the southwestern United States southward to Guatemala. It was listed on 22 July 1983 as endangered-group 2 in New Mexico. Key habitat areas are in Eddy and Hidalgo counties including dense stands of mesquite (Prosopis spp.) and associated growth in canyon bottoms. Loss of suitable habitat is the greatest threat to this species.

Jaguar (Panthera onca) historically occurred in southern New Mexico to south of the Mexican border. Historic records indicate that jaguars occupied pine and spruce (Picea spp.) timber in the San Andres and Sacramento Mountains. It is Federally listed as endangered. Loss of habitat is the main threat to this species.

Penasco least chipmunk (Eutamias minimus atristriatus) is confined to southeastern New Mexico on Sierra Blanca in the Sacramento Mountains of Otero County. It was listed on 22 July 1983 as endangered-group 1 in New Mexico and as a Federal candidate under review for listing. Key habitat occurs in and near ponderosa pine (Pinus ponderosa) at elevations of 5,500-7,500 feet MSL. Loss of suitable habitat is the major threat to this species.

Desert bighorn sheep (Ovis canadensis mexicana) exist in the San Andres NWR within WSMR. Only 23-29 individuals remain and an infestation of scabies mites stresses the remaining population. It was listed as endangered in New Mexico on January 24, 1975. The desert race of bighorn sheep historically ranged in New Mexico, Arizona, Texas, Sonora, and Chihuahua (Hall 1981). Key habitats in New Mexico, in addition to the San Andres Mountains, include the Big Hatchet and Peloncillo ranges. Habitat loss and parasite infestation are threats to this species.

Arizona black-tailed prairie dog (Cynomys ludovicianus arizonensis) inhabits portions of McGregor Range on Otero Mesa. It is Federally listed as a candidate C2 species. Its habitat is flat, dry, open grasslands of mesa tops or valley bottoms within broad limits of the Upper Sonoran zone. Persecution by man and overgrazing are threats to this species.

Texas horned lizard (Phrynosoma cornutum) inhabits arid and semiarid open country with sparse plant growth of border grass, cactus, juniper, acacia, and mesquite. It is a Federal candidate species with C2 status and is threatened in Texas. Collection is the major threat to this species.

White Sands pupfish (Cyprinodon tularosa) is endemic to the Tularosa Basin. It is listed as a Federal candidate species with C2 status. It occurs in Salt Creek, Mound Spring, and Malpais Spring within WSMR. Limited distribution, availability of water, and competition with other species are limiting factors for the species.

Baird's sparrow (Ammodramus bairdii) is known to occur on Otero Mesa as a migrant and elsewhere in the eastern plains and southern lowlands of New Mexico. It is listed as state endangered, group 2. The species has declined throughout its range from Prairie Provinces to South Dakota and Minnesota to Arizona and Texas and to Sonora. Breeding populations are threatened by drought, agriculture, and grazing of the shrubby shortgrass habitat favored by the species.

Bald eagle (Haliaeetus leucocephalus) is extremely rare in the area, except during winter as a migrant. It is listed by the USFWS, New Mexico, and Texas as endangered. The bald eagle ranges throughout North America, usually near large waterbodies but in migration along mountain ridges. Shooting, human disturbance at nest sites, loss of nesting trees and associated waterside habitat, and pollution of food are significant threats to this species.

Common ground dove (Columbina passerina) occurs from southeastern California to southern Texas and southward into Latin America as well as in the southeastern United States. It is a local warm-season visitor to the southernmost part of New Mexico and is state endangered, group 1. New Mexico is at the periphery of the range of this species and habitat conditions may be less than optimum for maintaining viable populations.

Southwestern willow flycatcher (Epidonax trailii extimus) occurs throughout the southwest as a migrant in spring and fall. It is a Federal candidate, C2, and state listed in New Mexico as endangered, group 2. This species occupies thickets, riparian woodlands, pastures, and brushy areas. It also follows willow- or cottonwood-lined streams out into desert. Threats to this species are unknown.

Environmentally Unique or Sensitive Areas

These areas were identified as having unique or sensitive resources which are deserving of protection from adverse impacts by all activities. Selection of exercise sites provided mitigation or elimination of adverse impacts through avoidance by incorporating the following selection criteria: (1) locate sites within 0.3 miles of an accessible road; (2) use sites with less than 10° slope; (3) avoid known or expected archaeological sites; (4) avoid areas with Federal or state threatened or endangered species (including candidate and sensitive species); (5) avoid areas with high biodiversity; (6) avoid arroyo riparian habitat; (7) avoid military and grazing facilities; (8) avoid areas containing important wildlife habitat (tall yucca, mesquite and sumac thickets); (9) avoid prairie dog towns; (10) avoid areas of critical environmental concern (research grasslands on Otero Mesa) and (11) avoid Wilderness Study Areas (WSA).

(1) Bighorn Sheep Habitat. The San Andres population on WSMR represents the only native desert bighorn population remaining in New Mexico. The San Andres National Wildlife Refuge, established in 1926, is entirely within WSMR and is operated by the USFWS under a co-use agreement for the primary purpose of preserving desert bighorn sheep. The refuge is located in the southern region of the San Andres Mountains and consists of about 57,200 acres, including about 23,700 acres in the Jornada Experimental Range. The total estimated population of desert bighorn sheep on WSMR was only 40 in 1941 and increased to about 300 in 1970, but began to decline in 1975 due to scabies (infestation of microscopic mites). The current population is low, and most remain within the San Andres National Wildlife Refuge.

(2) Playa Lakes. Playas are depressional areas in the central portions of closed drainage basins, such as Tularosa Valley and Hueco Bolson, that receive surface water flow from surrounding

areas. Playas are dry for most of the time, however. Fine-grained sediments, mostly sand, silt and clay are deposited in thin horizontal layers after heavy rains. Water permeability is slow and shallow standing water may remain up to a few weeks following heavy rains. Playas contain a higher diversity of grasses and shrubs with a higher content of silt and clay soils (more stable) than surrounding areas. However, playas are more subject to vegetational losses through soil compaction than adjacent areas. As wetlands, playas provide habitat diversity and increase water holding capacity in the arid environment.

(3) Arroyo Riparian Habitat. The drainages carved in the sandy-gravelly soils provide a greater diversity of plant species than adjacent "upland" areas. Consequently, these habitats support a greater diversity of wildlife species throughout the year. The food and cover provided in these long narrow drainages is available to numerous wildlife species because they often cross a variety of different habitats. Wildlife use riparian/arroyo areas as travel lanes (corridors) through their ranges. Maintenance of these areas helps to distribute wildlife populations over the available habitat. One of the goals of the existing Co-Use Area Habitat Management Plan is to minimize disturbance of Arroyo Riparian habitats for endangered species and nongame birds.

(4) New Mexico State University/Bureau of Land Management/Ft. Bliss Grassland Research Areas. The four vegetation study sites comprise 3,910 acres and have been designated as the McGregor Black Grama Grassland Area of Critical Environmental Concern. The sites are managed according to existing cooperative agreements between the Army, BLM, and NMSU. The sites are located along the western escarpment of Otero Mesa and State Road 506. The study sites meet the relevance and importance criteria because the sites contain rare pristine black grama grasslands and there is a need to highlight public and management interest in this unique resource. The BLM is the lead agency for management of the areas (BLM 1990).

(5) Prairie Dog Towns. The Tularosa Basin population of the black-tailed prairie dog was once believed to be a subspecies geographically isolated from its neighbors to the north and northeast. The population was first listed as endangered in New Mexico in 1975, but has since been delisted. The species is limited to the mesa grasslands on McGregor Range and the adjoining lands to the east and north. Sylvatic plague appears to limit populations. One of the objectives of the Co-Use Area Habitat Management Plan is to provide stable habitat and populations of black-tailed prairie dogs for ecosystem maintenance and wildlife research purposes (BLM 1990).

(6) Raptor Perches. The tall soaptree yuccas on Otero Mesa are used by a variety of hawks and also golden eagles for hunting and resting. These perches give raptors the height advantage in locating small rodents, desert cottontail rabbits, blacktail jackrabbits, and other prey. Dense stands of yuccas and the associated vegetation also provide important sources of food and cover for mule deer and pronghorn.

(7) The Aguirre Spring Campground and Dripping Springs Natural Area. These areas are located on BLM lands on the eastern and western slopes, respectively, of the Organ Mountains, near the WSMR main post. The BLM manages these areas for the unique natural

and geological features. The sites afford numerous seasonal hikers and campers various recreational experiences and solitude.

(8) Culp Canyon, Organ Mountains, Organ Needles, and Pena Blanca Wilderness Study Areas. Wilderness resources within these WSAs have been inventoried and are currently managed under the Interim Management Policy and Guidelines for Lands Under Wilderness Review. This management emphasis will continue until the area is either added to the National Wilderness Preservation System or removed from further wilderness consideration.

SOCIOECONOMICS

This section briefly describes the socioeconomic resources of the project area. Parameters discussed include population, employment, income, housing, and education. The term project area, as opposed to exercise area, refers to the entire area within which impacts are likely to occur. Impacts, particularly positive impacts on area economies, will occur both inside and outside of the exercise area.

For the purposes of socioeconomic discussions, the project area includes the following counties:

- Chaves, NM
- Dona Ana, NM
- Lincoln, NM
- Otero, NM
- Sierra, NM
- El Paso, TX

The bulk of socioeconomic impacts are likely to occur in Chaves County, New Mexico (which includes the town of Roswell) and El Paso County, Texas.

Population

Project area population, in 1990, was 859,028 (Table 3-5) (U.S. Department of Commerce 1991a). The county of El Paso, Texas, accounted for 69 percent of the total. The counties have experienced significant population growth since 1960 with the exception of Chaves County. Project area population doubled during this period. Population is expected to continue to increase at a 1.7 percent annual rate through 1994 (National Planning Data Corporation 1989).

Population density varies substantially within the project area (Table 3-5). El Paso County has 584 persons per square mile. The New Mexico counties vary between two and 36 persons per square mile; the average number of persons per square mile over the six county area is 32. Except for Dona Ana, the New Mexico counties all have densities of 10 or fewer persons per square mile. Because of the city of El Paso, most of the population is considered to reside in urban areas.

Table 3-5. Project Area Population in 1990 for the Joint Training Exercise Roving Sands 92, Ft. Bliss, Texas.

County	Population 1990	Percent of Total	Land Area (square miles)	Persons Per Square Mile
Chaves, NM	57,849	7%	6,071	10
Don Anna, NM	135,510	16%	3,807	36
Lincoln, NM	12,219	1%	4,831	3
Otero, NM	51,928	6%	6,630	8
Sierra, NM	9,912	1%	4,181	2
Subtotal New Mexico	267,418	31%	25,521	10
El Paso, TX	591,610	69%	1,013	584
Total	859,028	100%	26,534	

Source: U.S. Department of Commerce, 1991a.

The racial and ethnic mix of the population is dominated by non-Hispanic whites and Hispanics. Including El Paso County, the project area is 34 percent non-Hispanic white and 61 percent Hispanic. Excluding El Paso County, the percentage of non-Hispanic white residents increases to 52 percent while the percentage of Hispanic residents decreases to 43 percent. The project area also has a small population of African-Americans and Native Americans (U.S. Department of Commerce 1991a).

Employment and Income

Employment in the project area totalled 330,551 in August, 1991 with 227,288 in El Paso and 103,223 in the New Mexico counties (U.S. Department of Commerce 1991b). Unemployment was 9.5 percent, significantly above the national average of 6.55 percent (U.S. Department of Labor 1991). Unemployment in El Paso County has tended to be higher than the remainder of the project area. Unemployment in Chaves County, while low through much of the 1989-1991 period, has recently climbed to 11.2 percent.

Leading employment sectors include government, services (e.g., health services, business services, personal services), retail trade and manufacturing. In particular, government employment (Federal civilian and military and state and local) accounts for 25.6 percent of project area employment compared to 15.2 percent in the rest of the nation. The military accounts for 7.0 percent of project area employment, more than three times the national average. In the New Mexico counties, agriculture is relatively important compared to the overall national data but accounts for only 3.7 percent of total employment.

Total personal income within the project area in 1989 was \$9.5 billion (U.S. Department of Commerce 1991c). The leading sectors for income follow those of employment. Government income accounts for 22.4 percent of total income compared to 11.8 percent nationwide. Military income accounts for 5.3 percent of total income.

Housing

In 1990, the project area contained 302,263 housing units of which 271,356 were occupied (U.S. Department of Commerce 1991a). The total includes 105,220 rental units, of which 97,274 were occupied. The overall vacancy rate was 6.7 percent for non-seasonal housing and 7.6 percent for rental housing. Approximately 62 percent of the units are in El Paso County.

Education

The exercise will consist of short term assignments to the project area. No school age dependents will be involved.

HISTORIC RESOURCES

Federal law and regulations require Fort Bliss and WSMR to conduct programs to locate, inventory, evaluate, and protect historic resources and to mitigate the potential adverse effects of training exercises such as RS 92. Much of this work has been concentrated in the southern basin (Beckes et al. 1977; Whalen 1977, 1978; Carmichael 1986; Hard 1983a, 1983b, 1986; Skelton 1981; Seaman and Doleman 1986; Clifton et al. 1987, 1988); however, the more environmentally diverse northern basin and the Jornada del Muerto have also been the focus of both military related assessments and academic research (Eidenbach et al. 1990; Sudar and Laumbach 1990; Clifton 1987, 1987a; Seaman and Doleman 1988; Kirkpatrick 1986; Laumbach 1985a; Laumbach and Kirkpatrick 1985b; Kelley 1984; Laumbach 1981; Wimberly and Rogers 1977; Peckham 1976; Kelley 1966). Recent investigations, such as the Border Star 85 survey (Seaman et al. 1986) and GBFEL-TIE projects (Anschuetz and Doleman 1988; Schutt and Chapman 1988; Swift et al. 1988), have revealed that cultural remains within the northern basin are more continuous, abundant, and variable than previously recognized (Doleman 1988). Large sites, probably structural and residential, are associated with ephemeral drainage-mouth ponds on the basin floor and the assumption that the alluvial fans along the periphery of the basin were the focus of agricultural activities is in question (Anschuetz and Doleman 1988).

The occupational history of the Tularosa Basin consists of six prehistoric and historic periods (Laumbach and Kirkpatrick 1985; Wimberly and Rogers 1977): (a) Paleo-Indian (ca. 10,000-6,000 B.C.), (b) Archaic (6000 B.C.-A.D. 1), (c) Formative (A.D. 1-1400), (d) proto-historic and historic Apache (A.D. 1600-1870), (e) Anglo/Hispanic (A.D. 1870-1945), and (f) Military use (A.D. 1945-present).

As noted in the cultural resource management plan for WSMR (Breternitz and Doyel 1983), the extreme northern portion of the Tularosa Basin around the Malpais and areas to the north are poorly to completely unknown archeologically. Although data related to

known sites were derived from limited areal or linear surveys related to recent construction or land modification, more than 120 prehistoric sites are known within the northern section of the basin. Undiagnostic lithic scatters, Archaic sites, sherd and lithic scatters attributed to the Jornada Mogollon, and intermittent occupation from the Paleo-Indian to the historic Apache periods have been recorded. Petroglyph locations have been noted in the canyons between the Jornada del Muerto and the Tularosa Basin. Historic resources in the northern portion of the Tularosa Basin are situated primarily along the base of the San Andres and Sierra Oscura Mountains at water sources. Historic cattle and goat ranches and associated features are present as well as the abandoned town of Estey City (Breternitz and Doyel 1983).

Within the Jornada del Muerto, known prehistoric sites are attributable to the Paleo-Indian, Archaic, Jornada Mogollon, and historic periods. The Archaic sites resemble the Cochise developmental sequence. The Jornada Mogollon sites are concentrated in the southern part of the region along the upper and lower bajada of the San Andres Mountains and at the mouths of major drainages (Breternitz and Doyel 1983). Historic period resources are limited to ranches along the western slope of the San Andres Mountains, the McDonald Ranch, and the historic Trinity Site complex.

Within the southern basin, several large-scale surveys (Beckes et al. 1977; Whalen 1977, 1978; Carmichael 1986), sponsored by Fort Bliss, have provided an initial data base concerning site distributions. The following discussion of the culture history of the region is derived from these major survey efforts.

It is well documented that the Tularosa Basin has been inhabited by humans throughout the Holocene. Prehistoric material cultural remains range from Paleo-Indian to Mogollon and possibly Apache. Hispanic and Euro-American presence dates to the 16th and 18th century, respectively. Knowledge of the settlement/subsistence patterns of the Preceramic (Paleo-Indian and Archaic periods) is limited in comparison with the later, major cultural phases (Mesilla and El Paso). Although a number of predictive site location models have been formulated for the Tularosa Basin and its environs, their usefulness is severely limited by the nature of settlement patterns and site preservation. These models remain overly generalized, but continuing research is contributing to their refinement.

Paleo-Indian

Currently, excavation is underway at a rockshelter about ten miles east of Oro Grande within the McGregor Range. Researchers have suggested that bones of Pleistocene animals found in association with cultural debris may predate the Clovis period. If proven, this would push back human occupation of McGregor range to about 25,000 years B.C. (De Garmo 1991). McGregor Range has no known recorded Clovis sites or localities at this time. The Clovis complex is not well represented in the region (Clifton and Sanders 1990). The nearest localities in southern New Mexico where Clovis materials have been recorded include Mockingbird Gap (Webber and Agogino 1968), Truth or Consequences (Clifton and Sanders 1990) and nearby Tularosa and WSMR (Harkey 1981, Laumbach 1985, and

Carmichael 1986). Data on the Paleo-Indian occupation are meager. Over the last several decades members of the El Paso Archeological Society have reported a number of Paleo-Indian localities, and it is also known that Paleo-Indian projectile points collected from the area exist in private collections.

The earliest known Paleo-Indian projectile points in the Tularosa Basin have been dated to around 9,000-8,000 B.C. (DeGarmo 1991). Fluted Folsom and Folsom-like points have been found in the desert lowland often in areas of relative elevation near relict lakes or playas (Beckes et al. 1977). Although the Folsom hunters typically occupied small transient camps, a multicomponent Folsom habitation site (FB1613) was recently excavated on Fort Bliss. This is the first of its kind in the region (De Garmo 1991). Between about 8,500 and 6,000 B.C. Paleo-Indian lanceolate projectile points found in McGregor Range are of the Plano tradition. A total of eight Paleo-Indian sites were recorded by Beckes et al. (1977) within the McGregor Range. All of them were found on the lowland desert floor in eroded contexts near playas. Two are discrete sites, but the remainder are either projectile point isolates or were found mixed with younger cultural material (Beckes et al. 1977).

Archaic Period (6,000 B.C.-A.D. 1)

Around 6,000 B.C. a widespread adaptive change is evident throughout the southwest, apparently in response to the Post-Pleistocene gradual dessication which triggered the current climatic regimes. The Archaic people were organized in small highly mobile groups that adopted a broad-based or generalized subsistence pattern seasonally scheduled to take advantage of different plant foods and animals from all the physiographic zones within their range. Data from Fresnal Cave in the Sacramento Mountains near Alamogordo were very useful in illuminating the nature of the Archaic broad-based adaptation (Wimberly 1972). Occurrence of maize dated to 1050 B.C. at Fresnal cave is an indication that cultivation may have been practiced during the Late Archaic Period. The Archaic culture is very poorly defined in southeastern New Mexico and Texas west of the Pecos. Absence of time-diagnostic projectile points or radiometric dates has made it very difficult to define the Archaic vis-a-vis Paleo-Indian camps (Beckes et al. 1977; Gerald 1980; Skelton 1981).

Within the Tularosa Basin and the Hueco Bolson a variety of site types (rockshelters, agave roasting pits, quarries and lithic reduction sites, and numerous hunting and gathering sites), assigned to the Archaic Period were reported from different environmental settings (Wimberly 1972; Beckes et al. 1977; Whalen 1978). Archaic base sites have been found in mountain caves and along the Rio Grande (Beckes et al. 1977). Several Archaic sites (34 percent of all the sites recorded by Beckes) were reported on the McGregor Range (Beckes et al. 1977). Site types include burned rock loci, lithic scatters, isolated hearths, rockshelters, complex quarry localities, and possible quarry/workshops (Beckes et al. 1977). Sites are distributed throughout all physiographic zones. On the McGregor Range most of Archaic sites are found in the Foothill Draw/Yucca Grassland Association of the Otero Mesa escarpment which is characterized by canyons and associated

rockshelters and caves (Beckes et al. 1977). No Archaic sites were recorded on the Mesa, and they occur in very low densities on the valley floor (Beckes et al. 1977).

Mesilla Phase (A.D. 1-1100)

The Mesilla Phase marks the beginning of the Formative Period in the Tularosa Basin. It is characterized by pithouse architecture and use of pottery. Intrusive ceramics (Mimbres Black on White) are an indication that the region was within the Jornada/Mogollon cultural sphere of influence. The difference between the Mesilla Phase mode of adaptation and that of the preceding Archaic Period is one of degree, not kind. Mesilla settlements manifest a greater degree of sedentism than those of the Archaic. In the Hueco Bolson, Mesilla Phase nuclear family residence sites are found scattered throughout the physiographic zones (Whalen 1978). Sites range in size from small to large camps to hamlets and even villages. Ceramic sites from this region are generally found at lower elevations (Clifton and Sanders 1991). On the McGregor Range, Mesilla sites, including a small village, several complex camp sites, hamlet localities, small open sites, and small rock shelters are fewer than Archaic sites (Beckes et al. 1977). Larger sites are located on stream-side terraces or adjacent to alluvial fans where drainage is sufficient for primitive horticulture. A 2.5-acre site (M-411) is situated at the mouth of a major canyon on the McGregor Range (Beckes et al. 1977).

Dona Ana Phase (A.D. 1100-1200)

The pithouse to pueblo transition phase was initially defined by ceramics from surface collections. Painted wares, including El Paso bichrome and polychrome, appear for the first time within the Jornada/Mogollon culture area. Other intrusive wares include Chupadero Black on White, Three Rivers Red on Terracotta, St. Johns Polychrome, and Lincoln Black on Red. This is the most poorly known phase of the Jornada/Mogollon. Lack of sufficient samples has continued to plague any attempt to statistically define it on the basis of ceramic attributes (Whalen 1977, 1978; Skelton 1981; Sale and Laumbach 1989). A lack of data from Dona Ana sites has led several people to refrain from making a distinction between Dona Ana and El Paso phases (Whalen 1977, 1978, 1980; Skelton 1981; Sale and Laumbach 1989). Beckes et al. (1977) reported the occurrence of Dona Ana sites on McGregor Range close to the alluvial fans on the eastern front of Otero Mesa. According to Beckes et al. (1977), probable Dona Ana sites include several apparent villages and a number of complex camp localities/possible seasonal hamlets. Suspected Dona Ana components include isolated rock shelters and several apparently special function, resource procurement, and processing stations. Most Dona Ana phase sites occur on draws and canyons but a few were recorded from the desert lowland (Beckes et al. 1977).

El Paso Phase (A.D. 1200-1400)

This phase marks a period of perhaps the most intensive use of the Tularosa Basin during the prehistoric period. Large pueblos of ten to over 100 rooms were built in rectilinear alignment facing east and sometimes enclosing a central plaza. In addition to

ceramic wares present during the Dona Ana Phase, Gila polychrome and Ramos polychrome are found in the El Paso Phase ceramic assemblages. The Farming/Residential sites are in the runoff zone of the Hueco Mountains (Whalen 1978)--the coalesced alluvial fans of the Sacramento Mountains and the portion of the desert lowland adjacent to the alluvial fans (Skelton 1981). This area provided well-drained arable land. Beckes et al. (1977) reported that 85 percent (260) of the sites recorded on McGregor Range had El Paso Phase components. Most of the large habitational sites occur on the lower desert basin with great agricultural potential (Beckes et al. 1977). This is an indication that the valley floor received greater precipitation than today. Beckes et al. (1977) also reported that several El Paso Phase farmsteads were found in upland locations near large intermittent river courses. Special activity sites are located near the type of resource being exploited regardless of the physiographic setting.

Abandonment of the Tularosa Basin and its environs by about A.D. 1400 has been attributed to a combination of factors ranging from climatic stress, the arrival of the Athabascan-speaking Apache in the area (Beckes et al. has reported occurrences of isolated Apache micaceous sherds at some sites on McGregor Range), to the collapse of Casa Grande as a regional commercial center. The local population may have joined larger pueblos to the north (Gran Quivera on the Chupadero Mesa) and Jumano villages to the south (Human Systems Research 1973).

Proto-historic and Historic Apache (A.D. 1600-1870)

Due to the scarcity of water, the general vicinity in and around the McGregor Range was never substantially explored or occupied until the mid part of the 19th century. Indeed, the range area had never been traversed by any of the early Spanish expeditions (Freeman 1977). Nevertheless, the Tularosa Basin area was considered to be part of the traditional lands of the Mescalero Apache who inhabited the region between the Pecos River and the Rio Grande (Schroeder 1974). The Mescalero Apache were noted in the Trans-Pecos region as early as 1583 by the Espejo expedition. The Apaches were originally Athabascan speaking, hunter-gatherers (probably affiliated with the Navajo) who had moved into the greater southwestern United States by the turn of the 15th century (Simmons et al 1989). After Spanish contact, the Apache quickly adopted the horse and became proficient mounted hunters of bison, as well as becoming skilled raiders. From northern New Mexico, the Apaches moved quickly down the Rio Grande Valley and to the east into the Tularosa Basin. By the mid to late 1600s, Mescalero Apaches were attacking Spanish settlements in southeast New Mexico, El Paso, and along parts of the Camino Real (Hackett 1937; Thomas 1941). As a result of these depredations, the Spanish authorities commissioned military campaigns in an attempt to rout the marauding Apache raiders. Military campaigns, such those carried out by Ugalde in 1787, had limited success against the Apaches in the region between the Rio Grande and the Pecos River.

Practically all of the Spanish colonial settlements in the region were established along the Rio Grande north and south of El Paso. These initial settlements were started in the late 1600s and early 1700s and consisted of mission-presidio systems which

promoted the conversion of local Native Americans (such as the sedentary Patarabueye of the La Hunta area) and provided a support base for newly settled Hispanic (many of which were Mestizo in descent) ranchers and agriculturalists. Many of the mission and presidios established in the vicinity of El Paso were a direct response in the attempt to control the Apache raids. Outside the Rio Grande Valley, the early Spanish settlers avoided the Tularosa Basin to the north out of fear of the Apaches. Nevertheless, it was recognized early on that the interior lands north of El Paso contained lush stands of grasses which were excellent for the grazing of livestock (Freeman 1977). Thus, by the time of Mexican Independence in the 1820s, the southern portion of the Tularosa Basin was being used as communal grazing lands. Nevertheless, these communal lands remained uninhabited by the settlers.

When lands north of the Rio Grande were ceded to the United States after the Mexican-American War in 1848, the U.S. Congress commissioned general land surveys of the Tularosa Basin north of El Paso for the construction of military and wagon routes which were planned to cross the region from Ft. Smith to Santa Fe (Freeman 1977). In 1849, Captain Randolph Marcy made an official survey of the southern portion of the Tularosa Basin, in the vicinity of the McGregor Range, from Dona Ana to Fort Smith. Marcy still had problems in hiring a guide for the expedition since the area between Dona Ana and the Pecos River was still in the hands of the Mescalero Apaches (Freeman 1977). Another U.S. Army Corps surveyor, by the name of John Pope, noted in 1854 that a portion of the southern Tularosa Basin (encompassing the south portion of the present day missile range) had already been claimed as a communal "pasture area" by the small community of San Antonio de Ysleta (Freeman 1977). Apparently, the inhabitants of the town had been grazing livestock on the land since 1828, if not earlier. This land was officially known as the Rancho de Ysleta Grant (Freeman 1977).

Anglo/Hispanic (A.D. 1870-1945)

From the late 1840s to the 1880s, the vicinity of the McGregor Range continued to be void of any settlements. Nevertheless, during this time, the surrounding communities of Lincoln, Mesilla, Tularosa, and La Luz were established. These communities were protected by Ft. Bliss, Ft. Stanton, and Ft. Filmore. The Mescalero Apaches were still the principal inhabitants of the territory and were frequently encountered by the U.S. Army from these forts. These encounters always resulted in hostile skirmishes between the two groups, of which the U.S. Army was initiating a policy of constant pursuit and final removal. In a single period between March 11, 1868 and December 26, 1869, there were over six skirmishes which had taken place in the Tularosa Basin (Freeman 1977). One of the last major engagements took place not far from the McGregor Range. In the spring of 1880, a detachment of 60 soldiers from the 9th Cavalry chased a group of Mescaleros along an Indian trail into nearby Dog Canyon, which had been an Apache stronghold for some time (Tinsley 1956). Once inside the canyon, the Mescaleros ambushed the cavalrymen, hurling boulders from above, resulting in the killing or critically wounding of the whole detachment. This victory was short-lived, however, and within

several years, nearly all of the Apaches had been removed from the Tularosa Basin.

After Indian removal in the early 1880s, more substantial settlement in the Tularosa Basin was possible. Ranching was to provide the greatest impetus for settlement in the basin as a result of the general westward expansion of the cattle market, and the development of deep well drilling technology (associated with windmills) which made water possible in an otherwise barren landscape (Freeman 1977). Railroads associated with the Southern Pacific System passed through the El Paso area and greatly facilitated the movements of goods (especially cattle) in and out of the southern Tularosa Basin. By the 1890s, several large cattle ranches had extended into the present-day boundaries of the McGregor Range. One of these, known as Wilde's ranch, was organized in 1885 and extended into the eastern portion of present day WSMR (Freeman 1977). About ten years later, another ranch, called the Fleck ranch, extended into the southern part of the range. Portions of the Fleck homestead still exist on the range lands and consists of several outbuildings, stock tanks, and various deep water wells. The earliest structure associated with the Fleck ranch consists of a stone dugout or "chosey" (called Campbell Tanks) dated to 1907 (Freeman 1977). By 1905, most of the northern section of the McGregor Range was under the ownership of another rancher named Oliver Lee (Freeman 1977). Remnants of the Lee homestead also exist on the range.

Between 1897 and 1899, the El Paso and Northeastern Railroad built an important spur from the city of El Paso north into the Tularosa Basin in order to obtain coal and timber from the White Oaks area (Freeman 1977). As a result, the area between Alamogordo and White Oaks prospered significantly. Gold was discovered in the Jarilla Mountains in 1905 and initiated a local boom in mining which centered around the town of Orogrande. The mining boom in the area was to last for less than a decade between the years 1900 and 1908.

After the mining boom, there was an influx of homesteading which resulted in the surveying of eighteen townships between 1915 and 1917 within the present day boundaries of the McGregor Range (Freeman 1977). Most of the population living within the vicinity of the missile range were concentrated around the Hueco Mountains and east of the town of Turquoise. By the 1920s, the number of homesteads increased dramatically, and most of the land patents within the present McGregor Range had been obtained by 1939 (Freeman 1977). The majority of historic sites on the range date to this period and consist of small, single family farmsteads.

Military Use (A.D. 1945-Present)

With the explosion of the first atomic bomb at WSMR, the civilian complexion of the Tularosa Basin was to change significantly. After the Second World War, and subsequent development of the military's missile program, the flat, relatively vacant lands north of Fort Bliss became attractive for the testing of rockets. In 1954, approximately 682,000 acres of private and public lands in the southern Tularosa Basin were acquisitioned by the U.S. government which resulted in the establishment of the present day McGregor Range.

SECTION IV ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

IV. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

This section describes the impacts that might occur as a result of the proposed RS 92 activities. The discussions of impacts are presented in the same order as in the previous section. More extensive discussions of impacts at Dona Ana/Orogrande complex and WSMR from the type of activities planned for RS 92 are contained in the Final Environmental Impact Statement of Ongoing Mission, Ft. Bliss, Texas (U.S. Army, 1984b), Environmental Assessment for Roving Sands '89 Fort Bliss, Texas (U.S. Army, 1989) and Installation Environmental Assessment for White Sands Missile Range, New Mexico (U.S. Army, 1985).

CLIMATE

There are no activities associated with RS 92 operations which are known to have either favorable or adverse climatic effects, especially in consideration of the short duration of the exercises. Unusual climatic conditions such as heavy rainfall or sustained high wind velocity could significantly influence conduct of exercises. Rainfall could be beneficial by reducing dust generation by vehicular movement. High winds could cause dust storms (which would be aggravated by vehicular movement) thus severely reducing visibility in maneuver areas. The lack of precipitation combined with high winds would increase fire hazard conditions which could preclude the use of pyrotechnics. However, these high winds are usually of short duration and test exercises adversely affected would be delayed only a few hours. The desert climate is particularly suitable for the types of training in RS 92; generally low rainfall and dry desert winds facilitate planning and operations. There are usually no temperature inversions during this time of the year which will facilitate dispersion of pollutant emissions from exercise vehicles, aircraft, and equipment.

GEOLOGY AND SOILS

The proposed exercises will not significantly impact the geology of the area. Adverse impacts to soils will occur primarily from maneuvering of tracked and wheeled vehicles, and secondarily through explosive ordnance detonation. These impacts will be minimal, however, because all ground units will be air defense artillery using nearly all wheeled vehicles and most maneuvering (vehicle travel off-road to static positions) will be restricted to or from established roads.

Maneuvering may result in some soil disturbance, including loss of surface soils with organic materials and nutrients. Some soils may be compacted if moist, thus reducing infiltration and causing additional stormwater run-off. Shearing of sandy soils will result in loss of cohesion, wind erosion, and dune formation. Mechanical destruction of vegetation will also contribute to soil erosion. Soils within the mesa grassland are comparably more stable regarding erosion than the shallow sandy soils in the sand dune-mesquite ecozone. Tracked vehicles will cause greater damage to soils than wheeled vehicles. Pivotal turns of tracked vehicles can displace soils to a depth of one foot. Most of the off-road

maneuvering will be restricted to ranges designated for use in ground force maneuvers. The present rate of erosion from maneuvering is largely unknown; however, measurements of sand movement and wind erosion on maneuver areas have been conducted (Marston and Gillespie 1987). The rate of sand transport was increased 10 fold on maneuver areas versus control areas on McGregor Range which resulted in local redistribution of sand particles into mesquite canopies (coppice dunes) and loss of fine-grained soil particles. The results indicated an apparent correlation between increased sand transport and maneuvering; however, soil surfaces on maneuver areas were stabilized following rains by formation of a soil crust (von Finger 1992). The results suggest that the rate and degree of crustal formation are seasonally dependent. Given this variability, more research is needed to determine the quantitative effects of crustal formation on eolian processes during different times of the year. However, the results indicate that regulating sediment transport from maneuvering was most important during summer months.

Explosive ordnance will result in local adverse impacts to soils, but is not expected to be significant. Ground-impacting explosives on Ft. Bliss will be limited to designated and established Dona Ana/Orogrande and McGregor Ranges. Ordnance on WSMR will be limited to established bombing ranges, i.e., Red Rio and Oscura bombing ranges. Indirect adverse impacts may result from ordnance-caused fires. These impacts involve loss of ground cover and consequent accelerated soil erosion.

WATER QUALITY AND SUPPLY

No significant impact is expected to occur on supply or quality of surface and ground water resources within the proposed exercise areas. No major surface waterbodies occur on Ft. Bliss where field training exercises are scheduled. The Rio Grande is the nearest major surface water, approximately four miles south of the main cantonment area, and is 30-40 miles south of the proposed exercise sites.

Surface waters within the basin flow only after periods of intense rainfall and occur mainly as flash floods. Most of the water quickly percolates into the dry desert soil or evaporates; however, some water collects in dry lakes intermittently. These ephemeral water sources are not suitable for general water use.

Accidental spills including gasoline, fuel oil, hydraulic fluid, or other chemicals and oils contained in smoke pots and generators could result in degradation of local water resources. However, Ft. Bliss and WSMR have prepared and employ spill prevention and control plans (US Army 1982, 1988). Absorbent material will be used to clean up all small spills and contaminated dirt will be disposed of in accordance with the plans. Small spills will be remediated on site by the training unit responsible and the unit commander will document the spill to Ft. Bliss EMO or WSMR ES-E. Contamination of the Rio Grande from the proposed field exercises would not occur because run-off from the proposed training sites does not reach the river. Extensive desert land separates the Rio Grande from exercise areas and is within a closed basin.

Surface and ground water resources at Roswell were not considered for impact assessment due to lack of ground activities. Water is provided to Stallion Range Center and North Oscuro Peak on WSMR by local wells and a desalination plant capable of processing potable water at a rate of 100,000 gallons per day. All of the requirements for the northern ranges are provided by this plant. The expected water consumption is 1,000 gallons per day. Wastewater will be discharged through sewer pipes to previously established evaporation ponds. Surface waters on WSMR that could be affected in the extreme event of an airplane mishap include Mound Springs, Lake Lucero, Malpais Springs, and/or Salt Creek. No such mishap has occurred during any previous joint training exercises at Ft. Bliss or WSMR.

The major source of water for Ft. Bliss and the City of El Paso is groundwater from the Hueco Bolson. The depth to the water table in all proposed training sites is at least 300 feet. Considering the type of exercises, scant rainfall, and high evaporation rate, no significant impact to the supply or quality is expected. McGregor Range is supplied with water from the City of El Paso. During the summer months, the City of El Paso uses water from the Rio Grande to supplement its water needs. If additional withdrawals will be needed to provide water for additional personnel at Ft. Bliss, notification will be given to El Paso concerning the expected increase in water use. It is expected that the increased demand for water during the proposed exercise can be supplied without over pumping or significantly increasing the drawdowns of wells in the Hueco Bolson. Table 4-1 lists the estimated water consumption rates compared to mean daily consumption and available water.

Sewage Treatment and Disposal

The El Paso Delta Street Wastewater Treatment Plant, about three miles south of the Ft. Bliss cantonment area, receives sewage production from the main cantonment area. Dona Ana, Oragrande, and McGregor Range camps have oxidation ponds that will be used to stabilize wastewater generated during field exercises. These ponds receive in excess of 1.2 million gallons of sewage per month with peak flows in July and August. Additional wastewater from the proposed exercises is not expected to overburden the oxidation ponds. Table 4-2 lists the estimated increase of sewage flow compared to average daily flow and treatment capacity.

In training areas, human waste will be disposed of in two ways. In the major bivouac areas, portable latrines will be used where field latrines (slit trenches) are not permitted on WSMR. Field latrines, three feet square by four feet deep, will be used in other areas. All latrines will be covered after the exercises. Considering the number of personnel that will use field latrines and soakage pits, scant rainfall, high evaporation rate, and depth to the water table, no significant impact is expected to the ground water resources. All field latrines and soakage pits will be constructed in strict compliance with Army Field Manual (FM) 21-20. On Ft. Bliss, kitchen and shower wastewater will be discharged directly to the ground surface. The Tularosa Valley is a closed basin (no discharge) and is therefore exempt from EPA regulations

Table 4-1. Estimated water consumption rates¹ compared to mean daily consumption and available supply for the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas

Location	Mean Daily Consumption	Increased Consumption	Available Water Supply
Roswell	29.0	0.16	40.0
Ft. Bliss			
Dona Ana	0.05	0.05	0.44
McGregor	0.06	0.02	0.40
Orogrande	0.38	0.02	0.66
Biggs AAF	2.26	0.08	5.0
WSMR	1.0	0.10	3.0

¹ Million gallons per day. Calculations based on 100 gallons per capita per day.

Source: U.S. Army 1990 Revised

Table 4-2. Estimated wastewater flow rates¹ compared to mean daily flow and treatment capacity for the Joint Training Exercise, Roving Sands 92, Ft. Bliss, Texas.

Location	Mean Daily Flow	Increased Flow	Treatment Capacity
Roswell	4.00	0.16	7.00
Ft. Bliss			
Dona Ana	0.04	0.05	0.18
McGregor	0.04	0.02	0.16
Orogrande	0.03	0.02	0.13
Biggs AAF	0.23	0.08	0.50
WSMR	0.45	0.10	1.00

¹ Million gallons per day. Calculations based on 100 gallons per capita per day.

Source: U.S. Army 1990 Revised

pertaining to surface water discharge. Licensed contractors will dispose of wastes from portable latrines located on WSMR.

AIR QUALITY

The vast open and remote space, favorable wind direction (SW), and dispersion factor of pollutants will result in minimal short term impacts on the area's air quality. The limited use of tank trails between Ft. Bliss, McGregor, Dona Ana, and Orogrande range camps may generate significant quantities of dust. However, because they are located far from civilian populations, there will be little or no annoyance to the public from fugitive dust. Tracked vehicles moving from the cantonment area in Ft. Bliss to training areas will use tank trails located east of Biggs AAF to avoid dust impacts to residential and industrial areas near the Ft. Bliss boundary. Light and medium trucks will use US Highway 54 or the eastern tank trails. El Paso, including Ft. Bliss, is a non-attainment area for inhalable particulate matter (Pm₁₀). However, the exercise will not significantly worsen existing conditions, especially considering the short duration of the exercise and the time of the year.

Vehicle use during the proposed exercises will generate particulates, hydrocarbons (HC), nitrogen oxides (NO_x), sulphur oxides (SO_x), and carbon monoxide (CO) emissions. Portions of the City of El Paso and Ft. Bliss are designated non-attainment areas for ozone and carbon monoxide; however, concentrations of SO_x and NO_x do not exceed National Ambient Air Quality Standards established by the EPA. Estimates of particulate concentrations generated by tracked and wheeled vehicles over dirt roads are not available. The majority of pollutant emissions will be produced by the operation of aircraft, vehicle, and field equipment such as generators. Emissions from other sources, including ground operations, refueling, support vehicles, and other mobile sources are expected to be relatively small and will be dispersed throughout the exercise area. No significant long-term adverse impacts on air quality are expected from these emissions. The additional emissions are not expected to result in non-conformity with the Clean Air Act of 1977, as amended in 1990. Most of the emissions will be dispersed rapidly at high altitudes over a wide uninhabited area. Comparison of emissions from previous exercises with national emissions data did not indicate a significant impact (U.S. Army 1990).

AMBIENT NOISE

Noise impacts from the proposed exercise may result from aircraft operation, missile and artillery firings, ordnance detonation and ground vehicle operations. Ordnance detonation during the exercise will be confined to established firing ranges greater than the minimum distance required by EPA from the noise source to prevent exposure to excessive noise levels. Although low cloud ceilings have sometimes allowed ordnance noises to be heard in Las Cruces, no significant adverse impact from missile and artillery firings is expected outside the installation boundaries.

Noise from vehicle operations is at a maximum during training exercises such as RS 92. Exterior noise levels from wheel or track vehicles are not sufficiently high to cause hearing damage in surrounding communities. The USAEHA data indicate that even with 10,000 vehicles (more than 10 times the number of vehicles actually involved) operating in a 24-hour period, the minimum distance from the noise source required to preclude annoyance is approximately 2.6 miles. Most vehicle operations during the proposed training exercises will occur throughout designated and established maneuver areas that are more than three miles from installation boundaries and represent minimal noise impacts to surrounding communities.

Increases in aircraft traffic are expected at WSMR, Roswell Industrial Airport, and Biggs AAF. The activities over these military reservations should not noticeably increase existing noise levels in populated areas, especially in consideration of the short duration of the exercise. Noise levels will increase considerably due to activities not normally associated with the installation's ongoing mission activities. Increased noise levels, particularly at night, may result in some adverse community response. The impacts will be minimized by complying with altitude requirements set by the Federal Aviation Administration (FAA). The exercise planners will strive to program low level aircraft sorties to minimize noise impacts to populated areas and areas containing bighorn sheep.

Helicopter flights over BLM land on the west side of the Organ Mountains and south of Soledad Canyon Road will increase noise levels in the area. The area is used by ranchers and hikers. The helicopters will deploy and redeploy foot soldiers quickly, thus will not be in the area for long periods and no significant long-term adverse impact to people in the area is expected.

Aircraft operating within WSMR and Ft. Bliss restricted airspace at high speed and altitudes below 3,000 feet AGL will be the primary noise sources. Localized noise levels in excess of 60 dB_{dn} will occur in remote areas for very short periods (five seconds on the ground) due to the low altitude activity. Low-level aircraft will avoid structures, vehicles, and people in sparsely populated areas by 500 feet slant distance in accordance with FAA regulations. In addition, aircraft flying over congested areas will be at least 1,000 feet above obstructions within a 2,000 feet radius of the aircraft and noise levels should be less than 69 dB_{dn}.

Exercise aircraft will restrict supersonic flight operations to designated airspace above 10,000 feet AGL over WSMR. During the conduct of a realistic air campaign in WSMR, sonic booms will probably be produced by aircraft engaged in aerial combat maneuvering (ACM) for short periods of time. Noise level contours indicated that the highest noise level audible beyond WSMR restricted airspace is 45dB_{L_{dn}} (C-weighted). The threshold for annoyance is generally considered to be greater than 50 dB_{L_{dn}}. Noise monitoring stations at WSMR (Plotkin 1989) detected an average of less than one sonic boom per day at any location. RS 92 is estimated to increase the number of sonic booms at any given location outside WSMR by less than one per five days. As mentioned previously, Plotkin (1989) reported that the majority of these booms generated overpressures at the WSMR boundaries of less than 1.0 PSF. The USEPA (1974) reported little or no public annoyance

with overpressures at or near 0.75 PSF. Based on these data and EPA guidelines cited above, sonic boom generated noise from supersonic training within WSMR should not adversely impact the public.

BIOLOGICAL RESOURCES

Activities which may produce adverse impacts on the ground include off-road vehicle traffic on Ft. Bliss training areas; explosive ordnance impacts; concentrations of vehicles, tents, and personnel; and aircraft disturbances. The whole exercise will impact less than one percent of the ground area on Ft. Bliss. Impacts from RS 92 generally will be less intense on Ft. Bliss maneuver areas than those produced on a regular basis from normal training exercises. However, most impacts on McGregor Range will be in addition to those incurred during normal training exercises especially since McGregor Range has not been used for this type of activity, i.e., ground activity associated with RS 92.

The impacts of simulated chemical attacks are largely unknown but will be a minor activity. The area covered by CS1 (the active ingredient of tear gas) and smoke will be limited to only portions of the exercise sites; neither is persistent in the environment and should not cause significant long term adverse impacts. Some adverse effects might occur to nesting birds and mammals, but most wildlife species are expected to simply leave/avoid affected areas.

Dispersion of chaff over WSMR is not expected to result in adverse impacts to biological resources. The materials in chaff are nontoxic and not harmful to livestock (U.S. Air Force 1989). Given the wide dispersion patterns of chaff (one dipole per square foot) and nontoxicity, plants should not be adversely affected. Likewise the potential impacts on animals will not be significant (e.g., low probability that chaff will be consumed by animals).

The projected impacts from maneuvering to biological resources on the Dona Ana/Orogrande complex have been previously addressed by the US Army (1984b). Therefore, the following paragraphs primarily address the anticipated effects within the McGregor Range.

Vegetation

Grassland communities occupy the greatest area of the proposed training sites and will, therefore, receive the greatest impacts. Vehicle positioning, equipment, and personnel may destroy grasses directly by crushing or trampling, and indirectly by soil compaction or erosion. Limited areas of yuccas within grasslands may also be destroyed by the planned activities. The yuccas and various shrubs that occur within the mesa grassland provide important habitat for a variety of wildlife. Raptors use shrubs for perching to locate prey and resting as well as for nesting. Non-game birds use the yuccas and cacti for nesting, feeding, and cover. Shrubs also provide sources of food and escape cover for pronghorn and mule deer. Tall yucca contribute to species and structural diversity to an otherwise homogeneous grassland.

Mesquite and creosotebush communities in the sand dune-alluvial fan areas (H/S sites) will also be impacted. These species are important in reducing erosion of the dry sandy soil. The deep sand dunes should receive relatively less disturbance because these

areas do not afford good maneuverability. The stabilized dunes provide important habitat for burrowing animals and other wildlife. Limited vehicle movement subsequent to occupying the training sites will result in minimal disturbance to vegetation.

Fires may temporarily destroy vegetation; however, fire suppression units will minimize the spread of wildfires. The greatest potential impact to vegetation and soils as a result of fires is expected in the mesa grassland areas.

No adverse impact is expected from the planned Nike/Patriot missile firing at McGregor Range. The programmed intercept will occur over the established Impact Area 2 which is in the center of the range. This training will not occur unless simulation tests confirm that no adverse impacts could result. Adequate fire prevention and suppression teams will be deployed in the event of fire. A back fire may be used prior to the Patriot firing to alleviate the potential for wild fires. A maximum area of 100m x 100m would be burned with consequent temporary losses of forage material and shelter for wildlife. BLM will assist in the coordination and implementation of back fires, if it is determined back fires are appropriate.

Reptiles and Amphibians

Snakes, lizards and toads throughout the exercise areas may be crushed or trampled by vehicles, equipment, or personnel. Indirect losses may result from destruction of habitat. The magnitude of the losses will depend primarily on current population levels and distributions. Due to the short duration of the exercises and limited ground activity, no long-term adverse impacts to the reptilian or amphibian populations are expected.

Birds

The proposed exercise will result in temporary disturbances to birds, primarily from ground activities. The greatest impacts will be to nesting birds, which may include mourning dove, cactus wren, crissal thrasher, black-throated sparrow, and western meadowlark. However, the effects will be minimal short term because of these species' extended nesting season and renesting ability. Most birds will simply avoid disturbed areas for the duration of the proposed exercises. Direct mortality is possible but should be rare; no long-term adverse impacts to bird populations are expected.

Mammals

Small mammals may be lost as a result of ground activities, including vehicle maneuvering, placement of equipment, and movement of troops. However, impacts will be minimized because of limited off-road vehicle travel and the high reproductive capacity of the species. Spotted squirrels, kangaroo rats, and various mice species are the most common species in the proposed training areas. Larger mammalian predators such as coyote and badger will be temporarily displaced from the training sites; however, this should be a minor disturbance given the large home ranges of these species.

Big game mammals that occupy the proposed training sites include mule deer and pronghorn. The fawning period (April-June) will include the dates of the proposed exercises. The small

percentage of habitat that will be disturbed by ground activities, wide distribution of these species, and their great mobility will result in minimal short term adverse impacts. Deer and pronghorn may be disturbed by low-level flying at high speeds. Lamp (1989) studied aircraft effects on large mammals at a Naval Air Station in Nevada; only minor impacts to mule deer and pronghorn were observed. It was concluded that other environmental factors were more significant than aircraft activity. The proposed air exercises are expected to result in minor adverse impacts by following established flight guidelines, i.e., no chasing or harassing big game animals and maintaining minimum slant distances. Bighorn sheep are discussed in the next section.

Threatened, Endangered and Protected Species

Plants

The site selection process emphasized avoidance of significant natural and historic resources. As a result the exercise sites are either free of protected species or they have been marked to avoid disturbance to them. Surveys resulted in location of one Scheer's pincushion cactus on H/S5 and three grama grass cactus plants on P2. Relocation of an H/S site avoided one specimen of a protected species, Neolloydia intertexta, which was recorded previously. The Scheer's pincushion cactus is a state protected species and was located within five meters of the road along the boundary of H/S5. The cactus was marked by flagging a 25 meter radius of the plant. The grama grass cacti are listed as Federal candidate (C2) species and were similarly marked to avoid potential adverse impacts. Therefore, no adverse impacts to protected plant species are anticipated.

Animals

Lamp (1989) reported minor reactions from desert bighorn sheep to aircraft disturbances. Miller and Smith (1985) found that bighorn sheep exhibited a greater reaction to one or two people on the ground than either vehicles or airplanes. However, low-flying planes (less than 500 feet AGL) did cause sheep to temporarily abandon an area. Studies conducted jointly by the USFWS and the Air Force Engineering and Service Center, under the auspices of the National Ecology Research Center, suggest that the potential for aircraft noise impacting bighorn sheep may be significant and that more studies are needed to resolve this question. However, bighorn sheep that have been exposed to impulse noises for a number of years at Nellis AFB, Nevada showed no significant change in pollution age structure, longevity, or reproductive success (U.S. Army 1985). Using tactical Air Force activity data extracted from flight schedule logs from Holloman AFB during 1988 and 1989, the number of range overflights in WSMR airspace at all altitudes by the Tactical Air Command (TAC) can easily reach 60 on a routine day. This estimate does not include an undetermined number of WSMR Research and Development flights which use the airspace down to 500 feet AGL. The expected daily airspace activity down to 500 feet from RS 92 is less than the daily average now occurring over areas at other military installations containing bighorn sheep. Neither

subsonic nor supersonic flights will be allowed over the San Andres NWR and other areas where sheep occur.

The San Andres NWR, which is over 35 miles south of the restricted supersonic airspace (Lava/Mesa), supports one of the last remaining populations of desert bighorn sheep. Overflights, even subsonic, may cause physiological stress (elevated heart rates), although no visual displays (startled reaction) may be observed (MacArthur et al. 1979). According to noise level contours from supersonic flights at WSMR, no physical or physiological damages to bighorn sheep on WSMR should occur. However, the WSMR population is already stressed by low numbers and an infestation of scabies mites. The cumulative effects of sonic boom disturbances and current stresses may be significant for this local population of bighorn sheep, but they are unknown. Given this situation, adverse impacts will be minimized by avoidance of areas containing sheep.

Most of the threatened or endangered bird species considered by this EA are casual migrants through the exercise area and it is unlikely that the proposed exercises will cause harm to any of the species. The common ground dove, gray vireo, black hawk, and ferruginous hawk are the only listed species that may be considered more common in occurrence. None of the listed bird species is likely to nest within the proposed training sites.

It is unknown if any aplomado falcons will return to WSMR during the exercise. Prior to the sighting in June 1991, the last confirmed sighting in New Mexico was in the 1950's. Considering the limited ground activities and high altitude air activities, no adverse impacts are expected.

Nongame birds showed startled responses to sonic booms but no lasting physiological damages or stress which would adversely impact reproduction. Hatching success, growth rate, or mortality were not different for incubated eggs subjected to overpressures from 2-5.5 PSF than from eggs not subjected to overpressures (Teer and Truett 1973).

Fracture of bird eggs may result from reflection and application of overpressures off canyon walls. This potential impact may be of particular importance to the prairie falcon (Falco mexicanus) and Swainson's hawk (Buteo swainsoni), which are known to nest within the exercise area. Although increased noise levels caused by low-level jet overflights and subsequent sonic booms caused a startled reaction among bird nestlings and adults of numerous species, no significant long-term adverse impacts to reproduction resulted (U.S. Air Force 1990).

The USFWS has determined that the occurrence of jaguar is not likely in the project area. In addition, the Penasco least chipmunk should not occur within the training sites. Therefore, no adverse impact to these species is expected.

The exercise area contains potential habitat for the Texas horned lizard, although no specimens were observed during the recent surveys. If the lizards do occur within the sites, incidental losses could occur due to crushing or trampling. Although these individual losses are not quantifiable, there would not be any adverse impacts to the species expected.

SOCIOECONOMICS

The following sections briefly describe the expected impacts on socioeconomic resources in the project area. Parameters discussed include population, employment, income, housing, and education.

The exercise will involve the temporary assignment of approximately 8,550 personnel. The personnel will be stationed in the Fort Bliss installation and training areas, near Stallion Range Camp on WSMR and near Roswell, New Mexico. The personnel will be deployed from 4 May 1992 till 11 May 1992. The exercise will be conducted 11-22 May and redeployment will occur 23-31 May.

To determine potential socioeconomic impacts, the following assumptions were made:

- (1) Personnel will stay an average of 26 days.
- (2) Average annual compensation for the personnel is \$25,000 including any additional duty pay.
- (3) Exercise supplies will be brought in, not purchased from the local community.
- (4) Housing will be a combination of military barracks, BOQs, and local hotels and motels under contract. It is assumed that 1,600 personnel in the Roswell area of Chaves County and 1,370 personnel in the Logan Heights and Biggs AAF areas of El Paso County will be housed in local hotels and motels.

Population

The exercise will involve, as noted above, an average stay of 26 days for each participant. The temporary nature of the exercise will not generate significant changes in local population.

Local population could theoretically be affected if: (1) the short-run economic impacts are substantial enough to induce non-military in-migration (positive change) or (2) the exercise disrupts the surrounding community, reduces social welfare (for example, by overburdening local resources and infrastructure) and induces out-migration (negative change).

The temporary economic impacts should not be large enough to induce significant in-migration. The impacts would be small because the exercise is of short duration, supplies are brought in and not purchased locally, local housing markets are not affected (except for short-term housing in local motels and hotels), and personnel will only be allowed in the local communities for short periods.

The exercise should not cause significant disruption in the local community and therefore is not likely to induce out-migration. Community disruption should be inconsequential due to the short duration and remote location of the exercise. Some minor, short-term impacts on local services (e.g., sewer, emergency services) can be expected.

Employment and Income

The short term deployment of 8,550 personnel into the project area will have positive impacts on area employment and income. Personnel will spend money in the local communities while on

passes, particularly for entertainment purchases such as food and drink. Also it is estimated that 2,970 personnel will be housed in area hotels and motels. Housing, food and entertainment expenses will impact the Roswell and El Paso economies. These impacts will be minimized because of the short-term nature of the exercise and the purchase of exercise supplies from outside the area.

The total direct and indirect economic impacts (employment and income) from RS 92 were estimated using the Training Impact Module of the Economic Impact Forecast System (EIFS) model developed and maintained by the Construction Engineering Research Laboratory (CERL) of the U.S. Army Corps of Engineers, University of Illinois, Champaign-Urbana. The Training Impact Module of the EIFS model is specifically designed to analyze exercises like RS 92. Module parameters were modified to account for specifics of the operation, primarily to reflect the absence of spouses and dependents and the lower propensity to consume due to intense exercise involvement during much of the 26 day visit.

The model estimated that project area sales volumes and income will increase by \$6.4 and \$16.1 million respectively (U.S. Army CERL 1991). Nearly all of the increase in income is attributable to military pay. All but \$811,000 of the income will leave the area with the military personnel. Local employment is expected to increase by 63 man-years. Most, if not all, of the increase in employment will be temporary in nature.

To analyze the significance of the impacts, the Rational Threshold and Forecast Significance models were run. These models were also developed by CERL. Both models indicated that the economic changes are well within the historic range of economic changes in the exercise area. For example, the increase in income represents only 0.2 percent of annual project area income. This is substantially less than the typical increase in income experienced in the project area over the last several decades. This level of change can be easily absorbed by the local community.

Specific communities within the project area are likely to experience more significant economic impacts. In particular, the town of Roswell (population 43,187 in 1990) will experience a positive economic stimulus. Due to the level of area unemployment, the increased economic activity should also be a positive socioeconomic factor.

The EIFS model was run for the Roswell area (Chaves County) to analyze the significance of local impacts. Of the 8,550 total personnel, 1,600 are expected to be stationed in the Roswell area. All are expected to be housed in local hotels and motels.

Results from the EIFS model indicate that Chaves County sales volumes and income will increase by \$1.4 million and \$3.0 million, respectively. All except \$148,000 of the income will leave the area with the military personnel. Local employment is expected to increase by 10 man-years. Most, if not all, of the increases in employment will be temporary in nature. Tests using the Rational Threshold and Forecast Significance models indicate that the economic changes are well within historical levels.

Housing

The personnel will be housed in military barracks, BOQs, and local hotels and motels under contract. Since the local hotels and

motels are not important to the year round housing market, there will be no impacts on the local housing market.

Education

The personnel will not be accompanied by dependents and therefore no impacts on educational resources are expected.

Recreation

Two or three 3-man teams will be deployed in the area west of the Organ Mountains on BLM land. The foot soldiers will use simulators for Stinger surface-to-air missiles. No ordnance will be involved in this portion of the exercise. This area is used by ranchers and hikers. Soldiers will endeavor to remain undetected throughout the exercise. Thus no adverse impact to recreational opportunities are anticipated.

HISTORIC RESOURCES

Reconnaissance survey level (45-meter transect intervals) and intensive survey level (15-meter transect intervals) within the McGregor Range has been completed. One square kilometer (1-km²) quadrants were surveyed initially at 45 meter intervals. The survey methodology, as defined by Fort Bliss guidelines, involved the delineation of crew leader transects and transect recording units on blue-line copies of aerial photographs (1:3000 scale) and the recording of all observations noted within the transect recording units on the aerial photograph. The presence of features or three artifact classes within a distance of 30 meters were the criteria for the definition of a site. All other observations were treated as isolated finds. If the initial reconnaissance level survey revealed the presence of a few isolated finds, the quadrant was then surveyed at 15 meter intervals to validate the presence or absence of archeological sites. If sites were encountered, adjacent areas were surveyed in order to locate a 1-km² area which did not contain archeological sites.

This survey effort resulted in the location of 20 1-km² which contain no archeological sites. Individual isolated artifacts were observed within several of these units, but as such, they are not regarded as significant archeological manifestations. Similarly, the intensive survey of ten 30-acre parcels resulted in the location of five units with no significant archeological manifestations. These are the final areas determined acceptable for use during RS-92 through consultation between the survey teams and the Environmental Management Office of Fort Bliss.

Near Stallion Range Camp in northern WSMR, 60 sites for ground-to-air defense operations have been designated. These locations have been examined by the WSMR historic resources personnel and it has been determined that their use will have no effect on the historic resources of the region.

SECTION V MITIGATION

SECTION V. MITIGATION

This section describes the measures/programs to be implemented to eliminate/mitigate potential significant adverse impacts. These measures and programs will be incorporated as part of the proposed action. Measures which will mitigate impacts on more than one resource are discussed first under general mitigation; other resource specific measures are described in the succeeding paragraphs.

GENERAL

All RS 92 commanders shall be required to coordinate with the Ft. Bliss Environmental Management Office (EMO) and/or WSMR Environmental Services Division (ES-E) for all components with fixed locations in the field. On McGregor Range, these locations will be restricted to the 1-km² and 30-acre sites that have been surveyed for historic resources, protected species and other selection considerations (discussed below). All ground activities on WSMR will be restricted to previously surveyed sites, thus avoiding adverse impacts to historic and natural resources. RS 92 unit commanders shall know the locations and extent of the "cleared" areas, as well as any off-limit areas within these areas, and shall inform the troops of these boundaries. Additionally, RS 92 unit commanders shall inform their personnel of site restrictions for ground units and aircraft pilots, e.g., no-fly areas on WSMR and other altitudinal restrictions specified in this EA. State Road 506 will remain open to public access except during the scheduled Nike missile firing, according to standard operating procedures for the installation.

Stinger surface-to-air missile simulator teams will be deployed on BLM land on the west side of the Organ Mountains. Soldiers will endeavor to remain undetected by the public throughout the exercise. The area north of Soledad Canyon and south of Dripping Springs will be off limits as well as Baylor Canyon. No digging, moving rocks, making structures with rocks, or open fires will be allowed. Troop insertion north of Soledad Canyon Road will be allowed only by ground vehicle on established roads. Finally, no cross country, off road vehicular travel will be allowed. These restrictions reduce the potential impacts to insignificance.

Potential impacts on the exercise sites were reduced to insignificance or precluded using the following site selection criteria prior to establishing sites: (1) locating sites within 0.3 miles of an accessible road; (2) using sites with less than 10° slope; (3) avoiding known or expected archaeological sites; (4) avoiding areas with Federal or state threatened or endangered species (including candidate and sensitive species); (5) avoiding areas with high biodiversity; (6) avoiding arroyo riparian habitat; (7) avoiding military and grazing facilities; (8) avoiding areas containing important wildlife habitat (tall yucca, mesquite and sumac thickets); (9) avoiding prairie dog towns; (10) avoiding areas of critical environmental concern (research grasslands on Otero Mesa) and (11) avoiding all Wilderness Study Areas.

RS 92 commanders shall familiarize their personnel with the Ft. Bliss and WSMR Fire Prevention and Control Plans and Spill Prevention Control and Countermeasures Plans. This responsibility involves insuring that all platoon leaders are aware of emergency procedures in the event of a fire or spill including points of contact (POC) and their telephone numbers.

Even though the magnitude of the RS 92 Joint Training Exercise is proposed to be greater than previous similar exercises, the environmental impacts are not expected to be significant due to the proposed use of previously disturbed sites and use to the greatest extent of the existing roads. Air activities are programmed to avoid over-flights above the San Andres NWR.

MANEUVER DAMAGE PREVENTION TEAM (MDPT)

The MDPT, comprised of representatives of FORSCOM, Ft. Bliss, WSMR and the 11th ADA, will be established to provide patrol of exercise areas to insure compliance with locational specifications, restrictions, and other mitigative measures. The members of the MDPT are acting as representatives of, and under the direction of, the environmental offices of Fort Bliss and WSMR. The MDPT shall be responsive to instructions and requirements provided by the EMO/ES-E personnel, and their activities will be monitored by those personnel. The radio-equipped control center will monitor and report on the field units' compliance with mitigative measures specified herein, as well as other Department of Defense (DOD) regulations. The MDPT shall insure that immediate corrective action is taken when needed and preclude any further damage. The MDPT will also support a minimum of two maneuver damage control teams each at Ft. Bliss and WSMR, comprised of personnel from FORSCOM and/or other tasked personnel, that will provide on-site inspection and assessment activities during the JTX.

In addition, the MDPT will be responsible for providing an engineering/environmental group during the redeployment phase which will prepare an After Action Report which summarizes environmental impact, effectiveness of mitigative measures, and the degree of compliance with the same. The After Action Report will describe items/situations to be immediately resolved and provide recommendations for measures to be implemented during future JTX programs that will alleviate/preclude adverse impacts.

The existing Memorandum of Understanding between BLM and Ft. Bliss identifies BLM as the responsible agency for vegetative monitoring, wildlife habitat management, and compliance with Federal and state laws affecting threatened and endangered species. BLM will thus be represented and contribute to the post-exercise inspection.

After the exercise is completed (within 30 days), an inspection will be conducted by MDPT/EMO/ES-E to determine if RS 92 resulted in damage to the off-limits areas/resources. If the inspection determines that the exercise caused significant adverse effect to the districts, more stringent avoidance procedures will be enacted prior to any subsequent Roving Sands exercise. A report of the results of the inspection will be provided to Ft. Bliss and WSMR environmental offices, state and Federal agencies consulted during the draft EA review, the New Mexico State Historic

Preservation Office (SHPO) and the Advisory Council within 60 days of the completion of RS 92.

SOILS

No anti-tank ditches, excavated gun/missile emplacements, or other excavation activities, with the exception of field latrines, will be allowed. Field latrines will be constructed only in areas where suitable soils and substrata occur, as identified by Ft. Bliss EMO and the New Mexico Environment Division (NMED). All field latrines will be constructed and operated in strict accordance with Army FM 21-10. Portable latrines will be used on WSMR.

Care will be taken to prevent erosion during exercises simulating the washing of chemical contamination from equipment. Excess wetting of the soil will be avoided and water under high pressure will not be directed toward unprotected soil.

Blading of roads necessary for heavy equipment travel may result in severe erosion of road beds and possible increased siltation of runoff. As mitigation, preparation of road beds will include construction of waterbars to reduce erosion. Limitation of vehicle use to existing roads, except in the designated training sites, will be required for protection of watershed and historic resources. Disturbed soils will be revegetated as soon as possible, if necessary, using native vegetation.

WATER QUALITY AND SUPPLY

The location of all field latrines will be coordinated with the Ft. Bliss EMO prior to siting. Slit trenches will be constructed for all field latrines, where permitted. Chemical latrines will be used on WSMR.

Field mess facilities will be established in accordance with TC 8-3 and FM 21-10. Grease traps will be used, if applicable. Soakage pits will be established in accordance with TC 8-3. Any permits required by the State of New Mexico for construction of such wastewater discharge facilities will be obtained by RS commanders prior to construction. Coordination with the Ft. Bliss EMO and/or WSMR ES-E will be maintained for siting and operating of these facilities. Field showers and latrines on Ft. Bliss will be established in accordance with FM 21-10 and TC 8-3. All effluent from field showers will be discharged directly to the ground. Laundry and shower effluent on WSMR will be discharged to evaporation pits previously established within Stallion and North Oscura range camps. Discharge from field kitchens on WSMR at and around Stallion Range Camp will be to evaporation pits previously established. Elsewhere on WSMR, grey water will be discharged to the ground.

Field water supply points will be established in accordance with TM 5-600. All equipment will be sited in such a manner as to minimize destruction of vegetation and to prevent erosion. Siting shall be coordinated with the Ft. Bliss and WSMR environmental offices. Vehicles will not be washed in the field; they will be washed only at washracks designated by the Ft. Bliss EMO and WSMR

ES-E. Location of a domestic water supply line into Orogrande and on the Otero Mesa will be off-limits to vehicle traffic.

Fuel bladders will be filled initially in the presence of personnel designated by the Ft. Bliss and WSMR environmental offices and will be inspected periodically during the operation to insure no spillage and/or seepage has occurred. If a spillage in excess of 50 gallons occurs, it will immediately be reported to the MDPT and either Ft. Bliss EMO or WSMR ES-E, as applicable, in order to activate the Spill Prevention, Control, and Countermeasure Plan (SPCC) and Installation Spill Contingency Plan (ISCP).

POL storage facilities will be constructed in accordance with FM 10-69, TM 5-4930-229-12P and FM 10-68.

An after-action report will be prepared by MDPT on any hazardous spill. The report will be submitted to the environmental office with jurisdiction over the affected area and will include the following: (1) general description; (2) type of substance; (3) quantity; (4) magnitude of the threat to public health, welfare, and natural resources; and (5) containment and cleanup activities.

SOLID AND HAZARDOUS WASTE

Waste POL will be placed in 55-gallon drums and taken to designated waste POL collection points. Waste POL products shall not be burned, dumped in trash containers, deposited at trash collecting points, spread on the ground, or dumped in drains or ditches. RS 92 unit commanders shall inform participants of the proper procedures for disposal of all waste POL and other hazardous/toxic materials (e.g., contaminated absorbent materials). Additionally, RS unit commanders shall insure that personnel are aware of obligations under the requirements of Ft. Bliss and/or WSMR hazardous waste management plan.

Solid waste generated at field mess facilities will be collected and disposed of in the Ft. Bliss sanitary landfill. Individuals will dispose of foodstuff containers in designated receptacles for transporting to the Ft. Bliss sanitary landfill. Burning and burying of refuse is prohibited.

Ordnance material will not be combined with solid waste refuse. Such material will be turned in and evacuated through salvage channels to appropriate Class V (ammunition issue) points.

BIOLOGICAL RESOURCES

Vegetative Communities

Open fires on Ft. Bliss and WSMR are prohibited. Pyrotechnics, other than blank ammunition and other non-fire producing material, on McGregor Range shall be restricted to times when climatic conditions provide a low potential for fire hazards. A documented fire prescription which defines weather parameters and fire control methods will be used to cover use of pyrotechnics.

Fire suppression will be the responsibility of each unit commander. Upon discovery of fire, ordnance firing will immediately cease and units will be responsible to react to and put out fires as they occur. A helicopter will be used to shuttle fire fighting personnel where rough terrain prevents vehicle or foot access to the fire area. Slurry drops will be used if a fire

cannot be contained and extinguished by hand. The Fire Management Officer of the Las Cruces District Office, BLM, will be consulted to help reduce risks and coordinate suppression plans and efforts.

Positions on McGregor Range will be limited to those areas previously surveyed and designated for use during RS 92. Positions at Dona Ana/Orogrande complex and WSMR will also be limited to those areas previously surveyed and approved. Deployment to these sites shall be conducted along established range roads only. Arroyos and riparian communities shall be considered off-limit areas, as will the four special grassland areas located on Otero Mesa.

No vegetation will be cleared unless absolutely necessary to emplace tents. All clearing will involve hand grubbing or clipping of small bushes/shrubs. No vegetation, live or dead, will be used for camouflage. There are about 60 sites designated for unit locations within WSMR. These sites have been cleared for historic and biological resources by WSMR ES-E. The use of some of these sites has been limited; detailed restrictions will be given to RS unit commanders (see Appendix B, Table B1). In accordance with U.S. Army Land Condition Trend Analysis Field Methods (U.S. Army 1991), special use plots (LCTA transects) will be established in 8-10 exercise sites and monitored after RS 92.

Wildlife

Harassment of, chasing of, and shooting at wildlife and livestock is prohibited and shall be enforced by unit commanders and MDPT personnel.

In the unlikely event wildlife and/or livestock are injured or killed during RS 92, the incident shall be reported to MDPT control personnel immediately. MDPT personnel shall be responsible for first notifying the Ft. Bliss EMO or WSMR ES-E. Follow-up notification of NMDGF, USFWS, or BLM will be coordinated between the MDPT and respective environmental office, as appropriate, to determine final disposition of the animal involved. All game species fall under NMDGF authority, all raptors fall under USFWS authority, and all livestock fall under BLM authority. While the activities associated with the exercise will discourage some wildlife reproductive attempts within the field training sites, RS 92 commanders shall take appropriate action to preclude adverse impacts to any wildlife reproductive attempts that are discovered within training areas. This will include notifying MDPT and placing the nesting, fawning, etc. site off-limits for the duration of the exercise.

Troop and vehicle concentrations and activities shall not take place within 1/4 mile of any wildlife or livestock water source on Ft. Bliss or WSMR.

Environmentally Unique or Sensitive Areas and Species

Off-road vehicle use by either tracked or wheeled vehicles, in playas, vegetated washes and arroyos, and man-made water catchments on Ft. Bliss or WSMR is prohibited for the duration of RS 92.

Supersonic and subsonic flights over the San Andres NWR and other areas containing bighorn sheep are prohibited. The USAEHA will conduct a noise monitoring study during RS 92 on the San Andres NWR to provide data for future RS exercises. Only emergency

situations will allow overflight of San Andres NWR. All planes and helicopters shall fly no lower than 3,000 feet AGL above the White Sands National Monument located within WSMR.

The White Sands pupfish could be harmed if fuel was accidentally spilled directly in or adjacent to Salt Creek. However, no refueling will be allowed in areas where this sensitive species might occur. All refueling points on WSMR will be north of Mockingbird Gap. In the unlikely event of a spill occurring within the immediate area of Salt Creek, the WSMR installation response team would respond immediately to control the spill. The aplomado falcon could be present during the exercise. If observed, the falcon's presence would be immediately reported to the MDPT. The MDPT, in coordination with WSMR ES-E, will then declare off-limits area.

HISTORIC RESOURCES AND OTHER NATURAL RESOURCES

Off-limit districts containing historic properties have been defined on Ft. Bliss in consultation with the State Historic Preservation Officers (SHPO) of Texas and New Mexico. Ecological control plots have been established to identify and monitor impacts caused by maneuver training. These also have been designated as off-limits districts in order to preserve the control nature of the plots. All such districts will be marked with signs and designated as off-limits to RS 92 activities ("in column" movement on existing roads to be permitted). All RS 92 controllers, umpires, unit commanders, and operation officers, down to platoon level or the equivalent, will be briefed about the marked areas, will be provided with maps showing their locations, and will be responsible for insuring the areas are avoided during all phases of RS 92. The marked areas will be monitored by MDPT personnel.

All RS 92 activities on the Otera Mesa and McGregor Range portions of Fort Bliss will be restricted to existing roads and trails and to areas that specifically have been cleared for the exercise. All sites that will be used on WSMR have been cleared previously. Certain stipulations have also been established for particular locations. At the Fair, Green and Granjean sites, the ranch houses and associated grounds are off limits to troops. In addition, supersonic flights will not be scheduled in the vicinity of the McDonald Ranch House and ground activity on the Trinity Site will be restricted to travel on existing roads.

The USAEHA will conduct a noise monitoring study at the Trinity site and White Sands National Monument. The data will be used to assess potential impacts, on these historic resources from future RS exercises.

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VI. BIBLIOGRAPHY

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SECTION VII

LIST OF ACRONYMS

LIST OF ACRONYMS

AAF	Army Airfield
ADA	Air Defense Artillery
AFB	Air Force Base
AGL	Above Ground Level
BDE	Brigade
BDU	Bomb Dummy Unit
BLM	Bureau of Land Management
BN	Battalion
BOQ	Base Officers Quarters
BP	Before Present
BTRY	Battery
CERL	Construction Engineering and Research Laboratory
CRC	Control and Reporting Center
CS	Tear Gas
CRC	Control and Reporting Center
dB	Decibels
DOD	Department of Defense
EA	Environmental Assessment
ECM	Electronic Counter Measure
EIFS	Economic Impact Forecast System
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EMO	Environmental Management Office
ES-E	Environmental Services Division
FAA	Federal Aviation Administration
FARP	Forward Arming and Refueling Points
FM	Field Manual
FORSCOM	Forces Command
FU	Firing Unit
GPM	Gallons Per Minute
HQ	Headquarters

IAW	In Accordance With
ISCP	Installation Spill Contingency Plan
JTX	Joint Training Exercise
L_{dn}	Day-Nite Average Sound Level
L_{eq}	Maximum Equivalent Sound Level
MDCC	Maneuver Damage Control Center
MDPT	Maneuver Damage Prevention Team
MSL	Mean Sea Level
NASA	National Aeronautics and Space Administration
NBC	Nuclear, Biological, and Chemical
NDP	Night Defensive Position
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environmental Division
NWR	National Wildlife Refuge
PM_{10}	Inhalable Particulate Matter
POC	Point of Contact
POL	Petroleum, Oils, and Lubricant
PPM	Parts Per Million
PSD	Prevention of Significant Deterioration
RS	Roving Sands
PSF	Pounds per Square Foot
SAR	Search and Rescue
SHORAD	Short Range Air Defense
SHPO	State Historic Preservation Officer
SPCCP	Spill Prevention Control and Countermeasures Plan
TACC	Tactical Air Command Center
TAOC	Tactical Air Operative Center
TM	Technical Manual
TDS	Total Dissolved Solids
TM	Technical Manual
TPWD	Texas Parks and Wildlife Department
USAEHA	U.S. Army Environmental Hygiene Agency
USFWS	U.S. Fish and Wildlife Service
WSMR	White Sands Missile Range
WTP	Wastewater Treatment Plant

APPENDIX A
TABLE A1. PROTECTED PLANT SPECIES
TABLE A2. PROTECTED ANIMAL SPECIES
TABLE A3. PLANT SPECIES OCCURRENCE

Table A1. Protected plant species known to occur within or near the exercise area for Roving Sands 92, Ft. Bliss, Texas.

Common name (scientific name)	Status ¹		
	Fed.	NM	TX
Alamo beard tongue (<u>Penstemon alamoensis</u>)	C2	E	
Button cactus (<u>Epithelantha micromeris</u>)		E	
Comal snakewood (<u>Colubrina stricta</u>)	C2		S1
Dense pincushion cactus (<u>Coryphantha dasyacantha</u> var. <u>dasyacantha</u>)	C2		S2
Dune unicorn plant (<u>Proboscidea sabulosa</u>)		S	
Grama grass cactus (<u>Toumeyia papyracantha</u>)	C2	E	S1
Gray sibara (<u>Sibara grisea</u>)		S	
Grayish-white giant hyssop (<u>Agastache cana</u>)		S	
Gypsum blazing star (<u>Mentzelia perennis</u>)		S	
Gypsum scalebroom (<u>Lepidospartum burgessii</u>)	C2	E	S1
Hueco mountain rock daisy (<u>Perityle huecoensis</u>)	C2		S1
Kuenzler's hedgehog cactus (<u>Echinocereus fendleri</u> var. <u>kuenzleri</u>)	E	E	
Mountain sage (<u>Salvia summa</u>)		T	S2
Night blooming cereus (<u>Cereus greggii</u>)	C2	E	S2
Payson's hiddenflower (<u>Cryptantha paysonii</u>)		S	

Table A1 (cont'd). Protected plant species known to occur within or near the exercise area for Roving Sands 92, Ft. Bliss, Texas.

Common name (scientific name)	Status ¹		
	Fed.	NM	TX
Perityle (<u>Perityle staurophylla</u> var. <u>staurophylla</u>)		S	
Plank's catchfly (<u>Silene plankii</u>)		S	S1
Resin-leaved brickelbush (<u>Brickellia baccharidea</u>)			S1
Sand sacahuista (<u>Nolina arenicola</u>)	C2		S2
Sand prickly pear (<u>Opuntia arenaria</u>)	C2	E	S2
Sandberg's pincushion cactus (<u>Coryphantha sandbergii</u>)		E	
Scheer's pincushion cactus (<u>Coryphantha scheeri</u>)		E	
Sneed's pincushion cactus (<u>Coryphantha sneedii</u>)	E	E	S2
Spoonleaf rabbitbrush (<u>Chrysothamnus spathulatus</u>)		S	S2
Texas tobacco root (<u>Valeriana texana</u>)		S	
Todsen's pennyroyal (<u>Hedeoma todsenii</u>)	E	E	
Wheeler spurge (<u>Chamaesyce geyeri</u> var. <u>wheeleriana</u>)			S1
Woven-spine pineapple cactus (<u>Neolloydia intertexta</u>)		E	
Wright's fishhook cactus (<u>Mammillaria wrightii</u>)		E	

¹ Endangered (E), Threatened (T), Federal candidate plant under review (C2), Critically imperiled in state (S1), Imperiled in state (S2), Sensitive (S).

Table A2. Protected animals known to occur within or near the exercise area for Roving Sands 92, Ft. Bliss, Texas.

Common name (scientific name)	Status ¹		
	Fed.	NM	TX
Arizona black-tailed prairie dog (<u>Cynomys ludovicianus arizonensis</u>)	C2		
Baird's sparrow (<u>Ammodramus bairdii</u>)		S2	
Bald eagle (<u>Haliaeetus leucocephalus</u>)	E	E	E
Common black hawk (<u>Buteogallus anthracinus</u>)		S2	T
Common ground dove (<u>Columbina passerina</u>)		S1	
Elegant trogon (<u>Trogon elegans</u>)		S1	
Ferruginous hawk (<u>Buteo regalis</u>)	C2		
Gray vireo (<u>Vireo vicinior</u>)		S	
Jaguar (<u>Panthera onca</u>)	E		E
Long-billed curlew (<u>Numenius americanus</u>)	C2		
Mississippi kite (<u>Ictinia mississippiensis</u>)		S	
Northern aplomado falcon (<u>Falco femoralis septentrionalis</u>)	E	S	E
Olivaceous cormorant (<u>Phalacrocorax olivaceus</u>)		S	
Penasco least chipmunk (<u>Eutamias minimus atristriatus</u>)	C2	S	
Peregrine falcon (<u>Falco peregrinus</u>)	E	S	E
Snowy plover (<u>Charadrius montanus</u>)	C2		

Table A2 (cont'd.) Protected animals known to occur within or near the exercise area for Roving Sands 92, Ft. Bliss, Texas.

Common name (scientific name)	Status ¹		
	Fed.	NM	TX
Southwestern willow flycatcher (<u>Epidonax trailii extimus</u>)	C2	S2	
Texas horned lizard (<u>Phrynosoma cornutum</u>)	C2		
Varied bunting (<u>Passerina versicolor</u>)		S	
White Sands pupfish (<u>Cyprinodon tularosa</u>)	C2		

¹ Endangered (E), Threatened (T), Federal candidate under review (C2), Federal candidate species under review (C2), Critically imperiled in state (S1), Imperiled in state (S2).

Table A-3. Plant species occurrence on HAWK/SHORAD (H/S) and Patriot (P) sites proposed for joint training exercises, Roving Sands 92, Fort Bliss, Texas.

<u>Scientific name</u>	<u>Common name</u>
<u>Agrostis</u> spp.	bentgrass
<u>Allium macropetalum</u>	desert onion
<u>Aloysia wrightii</u>	lippia
<u>Amaranthus fimbriatus</u>	pigweed
<u>Amaranthus palmeri</u>	pigweed
<u>Amaranthus</u> spp.	pigweed
<u>Ambrosia psilostachya</u>	western ragweed
<u>Ambrosia</u> spp.	ragweed
<u>Andropogon saccharoides</u>	silver bluestem
<u>Aristida adscensionis</u>	sixweeks threeawn
<u>Aristida divaricata</u>	threeawn
<u>Aristida purpurea</u>	purple threeawn
<u>Aristida</u> spp.	wire grass
<u>Artemesia ludoviciana</u>	Louisiana sagewort
<u>Artemisia filifolia</u>	sand sagebrush
<u>Astragalus</u> spp.	milkvetch
<u>Astragalus mollissimus</u>	wolly loco
<u>Atriplex canescens</u>	fourwing saltbush
<u>Baccharis</u> spp.	baccharis
<u>Baccharis pteronioides</u>	baccharis
<u>Bahia dissecta</u>	bahia
<u>Baileya multiradiata</u>	desert marigold
<u>Bouteloua gracilis</u>	blue grama
<u>Bouteloua curtipendula</u>	sideoats grama
<u>Bouteloua barbata</u>	sixweeks grama
<u>Bouteloua eripoda</u>	black grama
<u>Bouteloua hirsuta</u>	hairy grama
<u>Brickellia scabra</u>	brickelbush
<u>Cassia bauhinioides</u>	shrubby sena
<u>Cenchrus ciliaris</u>	buffel sandbur
<u>Ceratoides lanata</u>	winterfat
<u>Chenopodium graveolens</u>	lamb's quarters

Scientific name	Common name
<u>Chloris virgata</u>	windmillgrass
<u>Chrysothamnus nauseosus</u>	rubber rabbitbrush
<u>Cirsium undulatum</u>	thistle
<u>Commelina</u> spp.	dayflower
<u>Condalia warnockii</u>	knifeleaf condalia
<u>Conyza canadensis</u>	horseweed
<u>Coryphantha scheeri</u>	Scheer's pincushion
<u>Coryphantha macromeris</u>	long mamma cactus
<u>Coryphantha vivipara</u>	coryphantha
<u>Crepis</u> spp.	hawksbeard
<u>Croton texensis</u>	croton
<u>Crypthantha</u> spp.	crypthantha
<u>Cucurbita foetidissima</u>	buffalogourd
<u>Cymopterus</u> spp.	cymopterus
<u>Cyperus</u> spp.	flatsedge
<u>Dalea formosa</u>	feather dalea
<u>Datura wrightii</u>	jimson weed
<u>Datura stramonium</u>	jimson weed
<u>Delphinium</u> spp.	larkspur
<u>Descurainia pinnata</u>	tansymustard
<u>Dithyrea wislizenii</u>	spectaclepod
<u>Dyssodia pentachaeta</u>	five-needle dogweed
<u>Dyssodia acerosa</u>	prickly-leaf dogwood
<u>Echinocactus</u> <u>horizonthalonius</u>	turk's head
<u>Echinocereus dasyacanthus</u>	Texas rainbow hedgehog
<u>Echinocereus fendleri</u>	Fendler's hedgehog
<u>Echinocereus pectinatus</u>	rainbow hedgehog
<u>Echinocereus</u> <u>triglochidiatus</u>	flaming torch hedgehog
<u>Ephedra trifurca</u>	long-leaf ephedra
<u>Ephedra torreyana</u>	torrey ephedra
<u>Eragrostis</u> spp.	lovegrass
<u>Eragrostis cilianense</u>	lovegrass
<u>Eragrostis lehmanniann</u>	lovegrass

Scientific name	Common name
<u>Erigeron divergens</u>	spreading fleabane
<u>Eriogonum polycladon</u>	sorrel buckwheat
<u>Erioneuron pulchellum</u>	fluffgrass
<u>Erodium cicutarium</u>	filaree
<u>Euphorbia prostrata</u>	spurge
<u>Euphorbia albomarginata</u>	whitemargin spurge
<u>Flourensia cernua</u>	tarbush
<u>Gnaphalium chilense</u>	pearly everlasting
<u>Gutierrezia sarothrae</u>	broom snakeweed
<u>Haplopappus gracilis</u>	slender goldenweed
<u>Haplopappus spinulosus</u>	ironplant goldenweed
<u>Haplopappus</u> spp.	goldenweed
<u>Helenium</u> spp.	sneezeweed
<u>Helianthus annuus</u>	sunflower
<u>Heterotheca</u> spp.	heterotheca
<u>Hilaria mutica</u>	tobosa
<u>Hoffmanseggia glauca</u>	tushpea
<u>Hymenopappus</u> spp.	hymenopappus
<u>Iva</u> spp.	sumpweed
<u>Juniperus</u> spp.	juniper
<u>Koeberlinia spinosa</u>	allthorn
<u>Larrea tridentata</u>	creosotebush
<u>Lepidium montanum</u>	mountain pepperweed
<u>Lepidium virginicum</u>	peppergrass
<u>Lesquerella</u> spp.	bladderpod
<u>Leucelene ericoides</u>	baby aster
<u>Linum</u> spp.	flax
<u>Lycium berlandieri</u>	wolfberry
<u>Lycurus phleoides</u>	wolftail
<u>Machaeranthera</u> spp.	tansy-aster
<u>Mammillaria</u> spp.	mammillaria
<u>Mammillaria heyderi</u>	flat cream pincushion
<u>Marrubium vulgare</u>	horehound
<u>Maurandya wislizenii</u>	snapdragon vine

Scientific name	Common name
<u>Melampodium leucanthum</u>	plains blackfoot
<u>Mentzelia albicaulis</u>	whitestem mentzelia
<u>Mirabilis</u> spp.	four-o'clock
<u>Muhlenbergia porteri</u>	bush muhly
<u>Muhlenbergia pungens</u>	sandhill muhly
<u>Muhlenbergia arenicola</u>	sand muhly
<u>Muhlenbergia torreyi</u>	ring muhly
<u>Muhlenbergia repens</u>	muhly
<u>Nama densum</u>	matted nama
<u>Nolina microcarpa</u>	sacahuista
<u>Opuntia</u> spp.	pricklypear
<u>Opuntia violacea</u>	pricklypear
<u>Opuntia polyacantha</u>	plains pricklypear
<u>Opuntia phaeacantha</u>	pricklypear
<u>Opuntia imbricata</u>	walkingstick cholla
<u>Opuntia leptocaulis</u>	tesajillo
<u>Opuntia clavata</u>	club cholla
<u>Orobanche cooperi</u>	broomrape
<u>Panicum obtusum</u>	vine mesquite
<u>Panicum hallii</u>	panicum
<u>Panicum virgatum</u>	switchgrass
<u>Parthenium incanum</u>	mariola
<u>Pectis papposa</u>	pectis
<u>Perezia nana</u>	desert holly
<u>Phacelia</u> spp.	phacelia
<u>Phyllanthus polygonoides</u>	knotweed leafflower
<u>Proboscidea parviflora</u>	devil's claw
<u>Prosopis glandulosa</u>	honey mesquite
<u>Psilostrophe tagetina</u>	woolly paperflower
<u>Psoralea tenuiflora</u>	slimflower scurfpea
<u>Rhus microphylla</u>	littleleaf sumac
<u>Rumex crispus</u>	curly dock
<u>Salsola kali</u>	Russianthistle
<u>Scleropogon brevifolius</u>	burrograss

<u>Scientific name</u>	<u>Common name</u>
<u>Senecio longilobus</u>	threadleaf groundsel
<u>Setaria viridis</u>	green bristlegrass
<u>Setaria leucopila</u>	bristlegrass
<u>Sitanion hystrix</u>	squirreltail bottlebrush
<u>Solanum elaeagnifolium</u>	silverleaf nightshade
<u>Solanum rostratum</u>	buffalobur nightshade
<u>Sphaeralcea</u> spp.	globemallow
<u>Sphaeralcea subhastata</u>	globemallow
<u>Sporobolus cryptandrus</u>	sand dropseed
<u>Sporobolus flexuosus</u>	mesa dropseed
<u>Sporobolus contractus</u>	spike dropseed
<u>Sporobolus wrightii</u>	sacaton
<u>Sporobolus giganteus</u>	giant dropseed
<u>Sporobolus airoides</u>	alkali sacaton
<u>Stephanomeria exigua</u>	wirelettuce
<u>Stipa neomexicana</u>	needlegrass
<u>Thelesperma megapotamicum</u>	rayless greenthread
<u>Tidestromia lanuginosa</u>	tidestromia
<u>Toumeyia papyracantha</u>	grama grass cactus
<u>Verbena</u> spp.	verbena
<u>Verbesina encelioides</u>	crownbeard
<u>Viguiera stenoloba</u>	goldeneye
<u>Xanthium strumarium</u>	cocklebur
<u>Yucca torreyi</u>	spanish sword
<u>Yucca baccata</u>	datil yucca
<u>Yucca elata</u>	soaptree yucca

APPENDIX B
TABLE B1. WSMR UNIT LOCATIONS
TABLE B2. WSMR RANGE ROAD SEGMENTS

Table B1. White Sands Missile Range Unit Locations for Roving Sands 92.

SITE NAME	GRID	TYPE UNIT	REMARKS
Spec Site	CH5394627545	AFU/BN/BTRY/NDP/FU	
Range Road 5-1	CH4638943586	DECON SITE	Gravel Pit
Hilton	CH7400933877 (Bldg 33130) 33200	AFU 2 "A" Phones	Bldg/Roads/Pads
NOP #1	CH7360134171	HAWK COMMO/FDC	VIC Bldg 33171 No activity on or in Trees
NOP #2	CH7293635362	AFU	Must stay within fenceline, Bldg. 33192/33200. No activity on ? or in trees
Range Road 7-3	CH5534932067	AFU/BN/BTRY/NDP/FU	
DNA #1	CH6301822853	AFU/BN/BTRY/NDP/FU	
Range Road 7-5	CH3734827710	AFU/BN/BTRY/NDP/FU	
Gap Site	CH6668312625	COMMO RELAY	
D-9	CH6604910502	COMMO RELAY	
Range Road 12-1	CH7873306228	AFU	Vic gravel pit abandoned pit area
Range Road 5-6	CH4744414620	BN/BTRY/NDP/FU	
Fair Site	CH4794921492	BN/BTRY/NDP/FU	Temp Bldg. T-275 off limits
Range Road 20-2	CH6060125032	BN/BTRY/NDP/FU	Road entrance 606261
Green Site	CH4837433235	BN/BTRY/NDP/FU	Ranch House is off limits
Range Road 13-3	CH6314526671	BN/BTRY/NDP/FU NBC DECON	Trinity Site Parking Lot. All areas beyond fence are off limits to all Roving Sands personnel
Millars Watch Site	CH6681425973	BN/BTRY/NDP/FU	Flag cactus, place it off limits
GranJean Site	CH4481327473	BN/BTRY/NDP/FU	Including borrow pit but excluding island of Native desert between (?) and borrow pit
Range Road 7-5	CH5734827712	BN/BTRY/NDP/FU	

Table B1 (cont'd.)

SITE NAME	GRID	TYPE UNIT	REMARKS
Sulf Site	CH3888232343	BN/BTRY/NDP/FU	Large parking areas multiple pads
Range Road 24-4	CH6238939381	BTRY/NDP/FU	VIC mine site
Beck Site	CH6383232454	BTRY/NDP/FU	Graded area
Range Road 13-1	CH6271837379	NDP/FU	CH6331037586 turnoff to site
Gus Site	CH6256416679	NDP/FU	
Gallegos Site	CH5018029087	NDP/FU	
Gilmore Site	CH5653914763	NDP/FU	
Range Road 13-2	CH6352036785	NDP/FU	West side of road
Range Road 7-2	CH5411530988	NDP/FU	East side of R.R 7
Range Road 7-4	CH5611634277	NDP/FU	Norma site
Melton Site	CH4917524570	NDP/FU	
Range Road 20-1	CH5932025751	FU	
Range Road 7-6	CH6432515633	FU	Top of Hill-Area 20m next to road only
Range Road 7-7	CH5140937918	FU/NDP	
Range Road 5-2	CH4591843697	FU	Top of hill
Range Road 5-3	CH4267841740	FU	Top of hill
Range Road 5-4	CH4298841957	FU	Gravel pad
Range Road 5-5	CH4307241347	FU	Gravel pad
Range Road 7-1	CH4768442396	FU	Borrow pit east of road
Range Road 24-1	CH5384240273	FU	Borrow pit south of road
Range Road 24-2	CH6213639611	FU/NDP	South side of road
Range Road 24-3	CH6248139240	FU/NDP	Southwest of Mine site

Table B2. WSMR Range Road segments to be used by Chapparal units.

Range Roads 5 and 7

Along northern fence line from SRC to turn off to Comet Tank VIC CH631424 along the road passing Comet Tank to Mine Site

Along Range Road 24 to Mine Site

Along road heading east from Mine Site to CH642539431

Along road 13 to Beck site and north of CH616318

Range Road 13 from VIC CH616318 to Gilmore site (VIC CH566148) is off limits for employing fire units, however, road may be used for vehicle traffic

Range Road 20 is off limits for fire unit emplacement along its entirety

Access road VIC CH507377 from Range Road 7 to site Range Road 7-7 CH514378

Access road for Norma site off Range Road 7

Access road for site Range Road 7-5 (CH5734827710) to site R.R 7-5 and from intersection VIC CH572272 southeast to Range Road 20

Range Road 349 from intersection with Range Road 5, VIC CH445337 to Green site and northeast to intersection with Range Road 7 VIC CH516359

Access road from intersection of Range Road 7, VIC CH546294 west to Gallegos site south to intersection of Range Road 22, VIC CH498243 and west along Range Road 22 crossing Range Road 5, past GranJean well to Western reservation boundary fence line

Access roads beginning at intersections VIC CH552284 and CH555277 to spec site, ending at spec site

Range Road 26 from intersection with Range Road 5 VIC CH472143 east to Gilmore VIC CH566147. Road east of Gilmore is off limits for FU emplacement to the intersection of Range Road 26 and 13

Access road from intersection of Range Road 5 VIC CH452206 to fair site

Access road from intersection of Range Road 5, VIC CH437275 east to GranJean site and southwest to intersection with Range Road 22 VIC CH443259

Road 347 from intersection with Range Road 5 CH442307 to Sulf site

Table B2 continued.

Road intersecting with road 347 at VIC CH425308 south past GranJean well to CH3922223265

Road 334 from intersection with Range Road 5 VIC CH462427 southwest to Tiff site

Land fill road beginning south of SRC VIC CH473427 to CH4686941690

**APPENDIX C
CORRESPONDENCE
DISTRIBUTION LIST**



GEO-MARINE, INC.
ENGINEERING AND ENVIRONMENTAL SERVICES

7 October 1991

Mr. Bill Montoya, Director
New Mexico Game and Fish Division
Santa Fe, New Mexico 87503

RE: Roving Sands Joint Training Exercise

Dear Mr. Montoya:

This letter is to request a scientific collecting permit and information concerning threatened and endangered species. We will be working on a project to prepare an environmental assessment and programmatic environmental impact statement for the Roving Sands Joint Training Exercises proposed to be conducted at White Sands Missile Range, New Mexico, and Fort Bliss, Texas. The New Mexico portion of the project area is within Otero, Dona Ana, Lincoln, Socorro, and Sierra counties.

We expect to begin preliminary field surveys on 22 October. In order to conduct the necessary field surveys for threatened and endangered species, we must obtain a scientific collecting permit for plants and small mammals. Also, we need to obtain a state listing of threatened or endangered species and any candidate species for listing.

Your attention to this matter at your earliest convenience would be appreciated.

Sincerely,

Joseph J. Campo, Ph.D.
Certified Wildlife Biologist

JJC/brm

NEW MEXICO NATURAL HERITAGE PROGRAM

University of New Mexico
2808 Central Ave. SE
Albuquerque, New Mexico 87131
(505) 277-1991 FAX # (505) 277-3614

February 20, 1992

Joseph H. Campo, Ph.D.
Geo-Marine, Inc.
201 Napoleon
Baton Rouge, LA 70802

Dear Dr. Campo,

I have reviewed your list of protected plant species known to occur within or near the McGregor Range on Fort Bliss, Texas. There are two cactus species not on your list, Neolloydia intertexta and Epithelantha micromeris, that are both on the New Mexico State Endangered list and known to occur within your project area. In addition, there are eight more species on the State Sensitive list that are known to have potential habitat in or near the area. I am enclosing the list of species that you sent with my additions written at the end.

The current New Mexico state code for ranking plant species of concern is as follows:

E = Endangered in the state
S = Rare and Sensitive in the state
R = Review list of rare species about which we need more information

Your job announcement for field biologists was forwarded to two good candidates, and was also posted at the UNM Biology Department.

Best wishes for a successful field season.

Sincerely,

Ellen DeBruin

Ellen DeBruin
Botanist





GEO-MARINE, INC.

ENGINEERING AND ENVIRONMENTAL SERVICES

4 November 1991

Dr. Rudolph A. Rosen, Director
Fisheries and Wildlife Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

RE: Preparation of an Environmental Assessment and a Programmatic
Environmental Impact Statement for the Joint Training Exercise
Roving Sands at Fort Bliss, Texas and White Sands Missile
Range, New Mexico. Project No. 1161-015.

Dear Dr. Rosen:

We will be working on the above referenced project and require additional information regarding threatened and endangered species in the project area. Surveys for occurrence of threatened and endangered species of plants and animals will be conducted.

The purpose of the joint training exercises is to provide training in air defense deployment on worldwide joint contingency missions to deter or defeat threats to facilities and forces that are of strategic importance to the United States. It is estimated that 6,000 Army, Airforce, Navy, and Marine personnel will participate in Roving Sands 1992, along with 200 fixed/rotary wing aircraft and 3,000 wheeled vehicles. Most of the ground activity will take place on the Fort Bliss training area, McGregor Range, and be limited to existing roads and/or areas cleared for threatened/endangered species. The only exception is the planned use of Condron Army Airfield as VIP Center and tactical landing strip for helicopters and C-130 transport planes. Airplanes flying out of Biggs Army Airfield and Roswell will fight the air war in the air space above White Sands Missile Range.

1316 FOURTEENTH STREET
PLANO, TEXAS 75074
(214) 423-5480

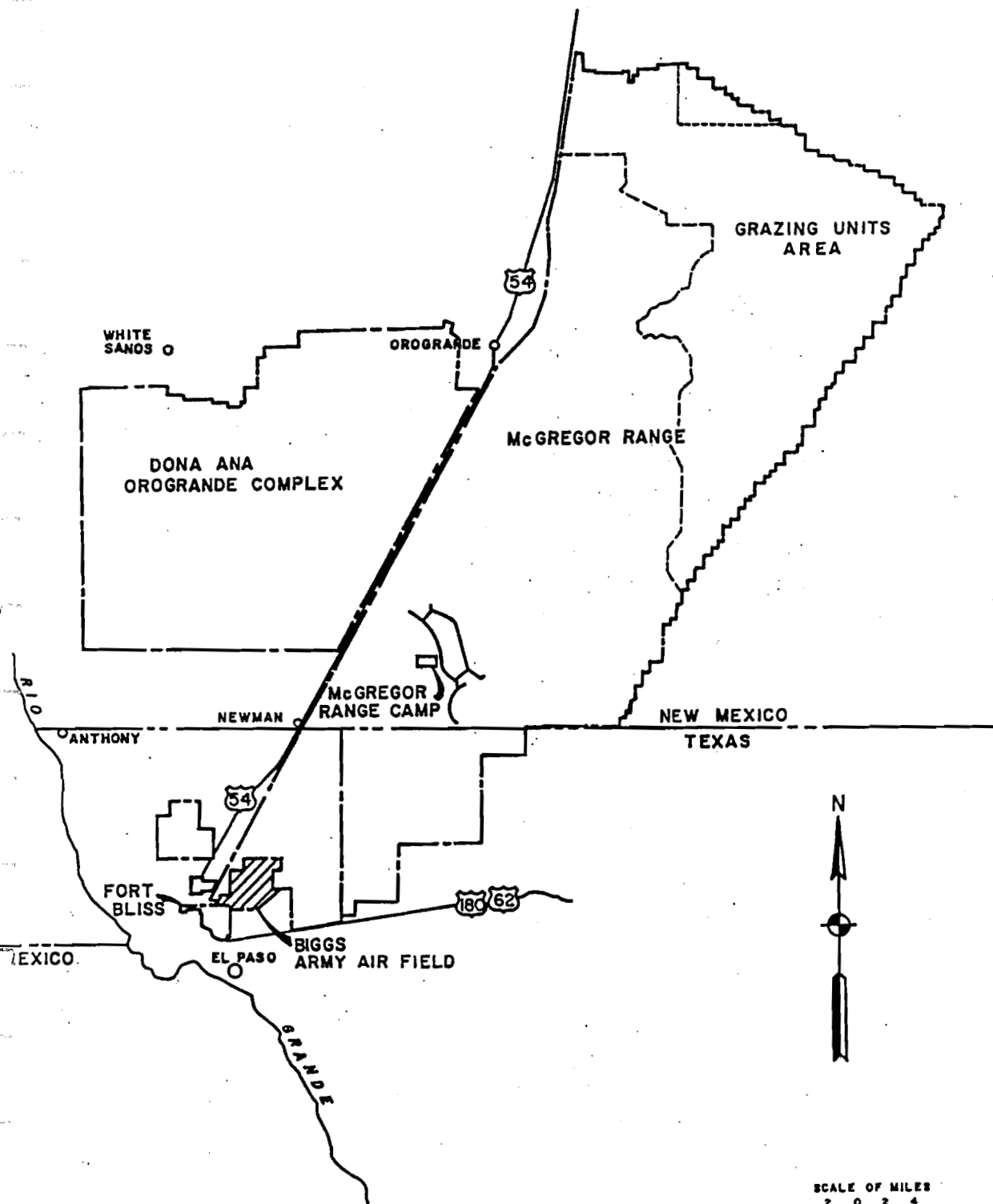
612 AMERICA STREET
BATON ROUGE, LOUISIANA 70802
(504) 338-9065

This letter has reference to an earlier request for information that was sent to Mr. Bob Cook. I have enclosed a map of the project area and a listing of the plants and animals that will be considered in the assessment. Please review this information for its completeness and accuracy. Also comment on any specific concerns that you have for threatened or endangered species and any candidate species in the area. Thank you for your time and cooperation.

Sincerely,

A handwritten signature in cursive script, appearing to read "Joseph J. Campo".

Joseph J. Campo, Ph. D.
Certified Wildlife Biologist



INSTALLATION LAYOUT

Preparation of an Environmental Assessment and a Programmatic
Environmental Impact Statement for the Joint Training Exercise
Roving Sands at Fort Bliss, Texas and White Sands Missile
Range, New Mexico. Project No. 1161-015.

Wildlife and plants possibly located on New Mexico border and Fort
Bliss, Texas Installation.

Endangered/Threatened Plants

- Alamo beard tongue (Penstemon alamoensis) - canyon bottoms, limestone hillsides, 5,000 feet.
- Grama grass cactus (Toumeva papyracantha) - grasslands, sandy soil. 5,000-7,300 feet.
- Grayish-white giant hyssop (Agastache cana) - low mountains. 5,250-6,225 feet.
- Gypsum scalebroom (Lepidospartum burgessii) - gypseous ridges/flats. 4,000 feet.
- Kuenzler's hedgehog cactus (Echinocerus fendleri var. kuenzleri) limestone ledges at juniper woodlands. 6,000 feet.
- Spoonleaf rabbitbrush (Chrysothamnus spathulatus) - pinyon, juniper zone/foothills. 4,000-7,000 ft.
- Todsen's pennyroyal (Hedeoma todsenii) - north and east slopes 45 degrees, gravelly, gypseous limestone under scattered pinyon. 6,600 feet.

Endangered/Threatened Animals

- Common black hawk (Buteo gallus anthracinus) - summer migrant, creeks, rivers, arroyos.
- Elegant trogon (Trogon elegans) - casual, sycamore, lower canyons
- Ferruginous hawk (Buteo regalis) - yearlong casual, grassy prairies
- Gray Vireo (Vireo vicinior) - mesquite/canyon bottoms
- Long-billed Curlew (Numenius americanus) - casual migrant
- Mississippi Kite (Ictinia mississippiensis) - migrant, open prairies /forest
- Mountain Plover (Charadrius montanus) - high plains, semi-desert
- Northern Aplomado Falcon (Falco femoralis septentrionalis) - migrant, open rangeland
- Olivaceous Cormorant (Phalacrocorax olivaceous) - near water
- Peregrin Falcon (Falco peregrinus) - migrant, wooded cliffs over rivers/lakes
- Snowy plover (Charadrius alexandrinus) - migratory from pacific coast
- Varied bunting (Passerina versicolor) - casual, mesquite-chaparral
- Jaguar (Panthera onca) - mountainous, pine-spruce timber
- Penasco least chipmunk (Eutamias minimus atristriatus) - ponderosa pine, oak-juniper



TEXAS
PARKS AND WILDLIFE DEPARTMENT
4200 Smith School Road • Austin, Texas 78744 • 512-389-4800

ANDREW SANSOM
Executive Director

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Dallas

WALTER UMPHREY
Beaumont

Mr. Joseph J. Campo
Goe-Marine
612 America St.
Baton Rouge, LA 70802

Dear Mr. Campo,

The Heritage Program reviewed your list of species of concern and offer the following list of additional species for the preparation of an Environmental Assessment and Programmatic Environmental Impact Statement for the Joint Training Exercise, Roving Sands at Fort Bliss, Texas, and White Sands Missile Range, New Mexico (Project 1161-015).

PLANTS

- Brickellia baccharidea (resin-leaved brickelbush)
- Cereus greggii var. greggii (desert night-blooming cereus)
- Chamaesyce geyeri var. wheeleriana (Wheeler spurge)
- Colubrina stricta (Comal snakewood)
- Coryphantha dasyacantha var. dasyacantha (dense cory cactus)
- Coryphantha sneedii var. sneedii (Sneed pincushion cactus; Federal and State listed endangered)
- Opuntia arenaria (sand prickly-pear)
- Perityle huecoensis (Hueco rock-daisy)
- Salvia summa (mountain sage)
- Silene plankii (Plank's catchfly)

INVERTEBRATES

- Sonorella metcalfi (Franklin Mountain talus snail)

Please contact Jackie Poole or Bill Carr (512-448-4311) for additional information on rare plants.

Sincerely,

A handwritten signature in cursive script that reads "David D. Diamond".

David D. Diamond, Ph.D.
Acting Branch Chief, Endangered Resources
Resource Protection Division



GEO-MARINE, INC.
ENGINEERING AND ENVIRONMENTAL SERVICES

4 November 1991

Ms. Karen Lightfoot
New Mexico Forestry Division
P. O. Box 1948
Santa Fe, New Mexico 87504

RE: Preparation of an Environmental Assessment and a Programmatic
Environmental Impact Statement for the Joint Training Exercise
Roving Sands at Fort Bliss, Texas and White Sands Missile
Range, New Mexico. Project No. 1161-015.

Dear Ms. Lightfoot:

We will be working on the above referenced project and require additional information regarding threatened and endangered species in the project area. Surveys for occurrence of threatened and endangered species of plants and animals will be conducted.

The purpose of the joint training exercises is to provide training in air defense deployment on worldwide joint contingency missions to deter or defeat threats to facilities and forces that are of strategic importance to the United States. It is estimated that 6,000 Army, Airforce, Navy, and Marine personnel will participate in Roving Sands 1992, along with 200 fixed/rotary wing aircraft and 3,000 wheeled vehicles. Most of the ground activity will take place on the Fort Bliss training area, McGregor Range, and be limited to existing roads and/or areas cleared for threatened/endangered species. The only exception is the planned use of Condron Army Airfield as VIP Center and tactical landing strip for helicopters and C-130 transport planes. Airplanes flying out of Biggs Army Airfield and Roswell will fight the air war in the air space above White Sands Missile Range.

The purpose of this letter is to request any information you have concerning threatened or endangered species which may occupy the area. I have enclosed a map of the project area and a listing of the plants and animals that will be considered in the assessment. Please review this information for its completeness and accuracy. Also comment on any specific concerns that you have for threatened or endangered species and any candidate species in the area. Thank you for your time and cooperation.

Sincerely,

A handwritten signature in cursive script, appearing to read "Joseph J. Campo".

Joseph J. Campo, Ph. D.
Certified Wildlife Biologist

State of New Mexico
ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT
Santa Fe, New Mexico 87505



LAURIE KING
GOVERNOR



ANITA LOCKWOOD
CABINET SECRETARY

MATTHEW BACA
DEPUTY SECRETARY

5 December, 1991

Joseph J. Campo, PhD
Geo-Marine, Inc.
1316 Fourteenth Street
Plano, Texas 75074

Dear Dr. Campo,

Several State Endangered plants that occur on White Sands Missile Range have potential to be in areas of the proposed joint training exercise locations and need to be added to your list of potential occurrences. They include Coryphantha scheeri (Scheer's pincushion cactus), Coryphantha sandbergii (Sandberg's pincushion cactus), Mammillaria wrightii (Wright's fishhook cactus), and Cereus greggii, (Night-blooming cereus).

We recommend that you conduct an endangered species biological clearance survey before proceeding with any construction or other major disturbance. If during your survey, you encounter any of these plants, we would appreciate knowing their exact locations.

If you have any questions, please do not hesitate to call Karen Lightfoot or Bob Sivinski, Endangered Species Botanists for the State of New Mexico.

Sincerely,

Raymond R. Gallegos
State Forester

By:

Karen S. Lightfoot

VILLAGRA BUILDING - 408 Galisteo
Forestry and Resources Conservation Division
P.O. Box 1948 87504-1948
827-5830

Park and Recreation Division
P.O. Box 1147 87504-1147
827-7465

2040 South Pacheco
Office of the Secretary
827-5950

Administrative Services
827-5925

Energy Conservation & Management
827-5900

Mining and Minerals
827-5970

LAND OFFICE BUILDING - 310 Old Santa Fe Trail
Oil Conservation Division
P.O. Box 2088 87504-2088
827-5800



GEO-MARINE, INC.
ENGINEERING AND ENVIRONMENTAL SERVICES

4 November 1991

Ms. Jamie Clark
US Fish and Wildlife Service
P O Box 1306
Albuquerque, New Mexico 87103

RE: Preparation of an Environmental Assessment and a Programmatic
Environmental Impact Statement for the Joint Training Exercise
Roving Sands at Fort Bliss, Texas and White Sands Missile
Range, New Mexico. Project No. 1161-015.

Dear Ms. Clark:

We will be working on the above referenced project and require additional information regarding threatened and endangered species in the project area. Surveys for occurrence of threatened and endangered species of plants and animals will be conducted.

The purpose of the joint training exercises is to provide training in air defense deployment on worldwide joint contingency missions to deter or defeat threats to facilities and forces that are of strategic importance to the United States. It is estimated that 6,000 Army, Airforce, Navy, and Marine personnel will participate in Roving Sands 1992, along with 200 fixed/rotary wing aircraft and 3,000 wheeled vehicles. Most of the ground activity will take place on the Fort Bliss training area, McGregor Range, and be limited to existing roads and/or areas cleared for threatened/endangered species. The only exception is the planned use of Condrum Army Airfield as VIP Center and tactical landing strip for helicopters and C-130 transport planes. Airplanes flying out of Biggs Army Airfield and Roswell will fight the air war in the air space above White Sands Missile Range.

The purpose of this letter is to request any information you have concerning threatened or endangered species which may occupy the area. I have enclosed a map of the project area and a listing of the plants and animals that will be considered in the assessment. Please review this information for its completeness and accuracy. Also comment on any specific concerns that you have for threatened or endangered species and any candidate species in the area. Thank you for your time and cooperation.

Sincerely,

A handwritten signature in cursive script, appearing to read "Joseph J. Campo".

Joseph J. Campo, Ph. D.
Certified Wildlife Biologist



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
Suite D, 3530 Pan American Highway, NE
Albuquerque, New Mexico 87107

December 4, 1991

Cons. No. 2-22-92-I-008

Joseph J. Campo, Ph.D.
Geo-Marine, Inc.
612 America Street
Baton Rouge, Louisiana 70802

Dear Dr. Campo:

This responds to your November 4, 1991 letter to Ms. Jamie Clark requesting additional information on species Federally listed or proposed to be listed as threatened and endangered. The information will be used in preparing an Environmental Assessment for proposed Roving Sands Joint Training Exercises to be conducted at White Sands Missile Range (WSMR), New Mexico, and Fort Bliss, Texas. The exercises include both ground and air maneuvers. Most ground activities will take place at McGregor Range, Fort Bliss, Texas. Condon Army Airfield will be used as a VIP center and tactical landing strip for helicopters and C-130 transport planes. Aircraft flying out of Biggs Army Airfield and Roswell Air Park will stage mock air battles over WSMR. Your area of interest includes El Paso County, Texas, and Dona Ana, Chaves, Lincoln, Otero, Sierra and Socorro counties, New Mexico.

The list of species you provided includes several species not currently listed, proposed or candidates for Federal listing as threatened and endangered:

Grayish-white giant hyssop	<u>Agastache cana</u>
Spoonleaf rabbitbrush	<u>Chrysothamnus spathulatus</u>
Common black-hawk	<u>Buteogallus anthracinus</u>
Elegant trogon	<u>Trogon elegans</u>
Gray vireo	<u>Vireo vicinior</u>
Mississippi kite	<u>Ictinia mississippiensis</u>
Olivaceous cormorant	<u>Phalacrocorax olivaceous</u>
Varied bunting	<u>Passerina versicolor</u>
Penasco least chipmunk	<u>Eutamias minimus atristriatus</u>

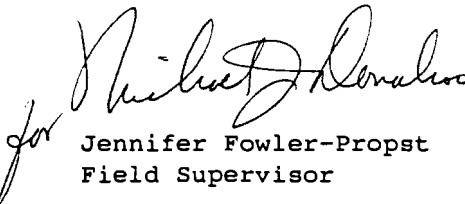
The following Federally endangered species included in your letter are not likely to occur in your area of interest:

Kuenzler hedgehog cactus	<u>Echinocereus fendleri</u> var. <u>kuenzleri</u>
Jaguar	<u>Panthera onca</u>

Several other species were omitted from your list and should be included. An up-to-date listing of Federally listed species likely to occur in your area of interest is enclosed for your information. These are the aplomado falcon, peregrine falcon, interior least tern, Todsens's pennyroyal, and Sneed pincushion cactus. The list has been expanded to include Category 2 candidate species (see enclosure). Category 2 candidates are species for which the Service has information indicating that proposing to list is possibly appropriate, but lacks substantial data on their biological vulnerability or threats to support the immediate preparation of proposed rules. Candidate species have no legal protection under the Endangered Species Act and are included in this document for planning purposes only. However, the Service would appreciate receiving any information currently available or recently gathered relevant to the status of these species.

Future requests for information concerning threatened and endangered species in New Mexico should be addressed to the New Mexico Ecological Services Office at the address on our letterhead. If you need further assistance, do not hesitate to call Mr. Gerry Roehm at (505) 883-7877 or FTS 474-7877.

Sincerely yours,


for Jennifer Fowler-Propst
Field Supervisor

cc:

Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals and Natural Resources Department,
Forestry and Resources Conservation Division, Santa Fe, New Mexico
Commanding General, U. S. Army (Attention: STEWS-EL-N, Ms. Daisan Taylor)
White Sands Missile Range, New Mexico
Regional Director, U.S. Fish and Wildlife Service, Fish and Wildlife
Enhancement & Refuges and Wildlife, Albuquerque, New Mexico
Refuge Manager, U.S. Fish and Wildlife Service, San Andres National
Wildlife Refuge, Las Cruces, New Mexico
Refuge Manager, U.S. Fish and Wildlife Service, Bitter Lake National
Wildlife Refuge, Roswell, New Mexico

Species List

Roving Sands Joint Training Exercise
U.S. Army White Sands Missile Range, Chaves, Dona Ana,
Lincoln, Otero, Sierra and Socorro Counties, New Mexico,
and Fort Bliss, El Paso County, Texas

December 4, 1991

Endangered

American peregrine falcon (Falco peregrinus anatum) - The peregrine falcon prefers areas with steep rocky cliffs in close proximity to water. Preferred habitat contains dense bird populations in conjunction with large gulfs of air such as is in canyons.

Authority: Sandy Williams, New Mexico Department of Game and Fish,
Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Aplomado falcon (Falco femoralis septentrionalis) - This species is very rare in New Mexico. The historic range of this bird includes Catron, Chaves, Dona Ana, Eddy, Grant, Hidalgo, Lea, Lincoln, Luna, Otero, Sierra, and Socorro Counties. This species is found in open woodland, savanna, or grassland habitats.

Authority: Sandy Williams, New Mexico Department of Game and Fish,
Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Interior Least Tern (Sterna antillarum) - This species nests on sandy beaches on shorelines of streams, rivers and lakes and is found on Bitter Lake National Wildlife Refuge.

Authority: Sandy Williams, New Mexico Department of Game and Fish,
Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Todsen's pennyroyal (Hedeoma todsenii) - This species is found on north and east facing steep slopes in gravelly gypseous limestone soil in pinyon and sometimes ponderosa pine vegetation. Its red-orange flowers appear from July to September.

Authority: Robert Sivinski, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division,
P.O. Box 1948, Santa Fe, New Mexico 87504-1948, (505) 827-7865.

Sneed pincushion cactus (Coryphantha sneedii var. sneedii) - This species usually prefers limestone ledges in the desert and grassland at 4,300 to 5,400 feet elevation.

Authority: Robert Sivinski, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division,
P.O. Box 1948, Santa Fe, New Mexico 87104-1948, (505) 827-7865.

Candidate Species - Category 2

Spotted bat (Euderma maculatum) - This bat is found in several national forests in New Mexico. This species tends to occur in remote areas, selecting specialized roosting sites. The presence of streams and nearby cliffs or steep hillsides with loose rocks may be habitat for this bat.

Authority: Scott Altenbach, University of New Mexico, Department of Biology, Albuquerque, New Mexico 87131, (505) 277-3411.

Arizona black-tailed prairie dog (Cynomys ludovicianus arizonensis) - This species is found on flat, dry, open grasslands of mesa tops or valley bottoms within broad limits of the Upper Sonoran Zone. Dona Ana County is within the historic range of this mammal.

Authority: John Hubbard, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9925.

Organ Mountains Colorado chipmunk (Eutamias quadrivittatus australis) - It is found on the Acquirre Springs Basin, including an area bordered by Baylor, Baldy, and Sugarloaf Peaks in the Organ Mountains. Occurs at elevations 1,845-2,225 meters. Found on north facing slopes supported by ponderosa pines and adjacent habitats dominated by oaks, junipers, Apache plume, and sumac. Inhabits fallen logs and rock piles.

Authority: None.

White Sands woodrat (Neotoma micropus leucophaea) - This species is endemic to White Sands. Specimen collected ten miles west of Point of Sands, White Sands National Monument, Otero County, at 4,100 feet elevation.

Authority: None.

Swift fox (Vulpes velox) - prefers open desert and plains. Usually found in short-grass prairie with loose sandy soil.

Authority: John Hubbard, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9925.

White-faced ibis (Plegadis chihi) - This species inhabits salt and freshwater marshes, shallow margins of muddy pools, ponds, and rivers.

Authority: Sandy Williams, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Western snowy plover (Charadrius alexandrinus nivosus) - Inhabits flat sandy areas, alkali flats, and areas near water which are devoid of vegetation or have very little vegetation.

Authority: Sandy Williams, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Long-billed curlew (Numenius americanus) - This species inhabits grassy plains and prairies, lakes and rivers, mud flats, and salt and freshwater marshes. Usually associated with wetlands that are located in grasslands area.

Authority: Sandy Williams, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Southwestern willow flycatcher (Empidonax traillii extimus) - This species inhabits thickets, riparian woodlands, pastures, and brushy areas.

Authority: Sandy Williams, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Ferruginous hawk (Buteo regalis) - Found almost statewide during migration. This bird seems to key in on wide open grasslands and prairies, especially for nesting.

Authority: Sandy Williams, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9914.

Texas horned lizard (Phrynosoma cornutum) - Dark stripes radiate from the eye region on each side of its face. Two rows of pointed fringe scales on each side of the body. The lizard inhabits arid and semiarid open country with sparse plant growth--bunch grass, cactus, juniper, acacia, and mesquite. The substrate may be of sand, loam, hardpan, or rock. Some loose soil is usually present in which these lizards bury themselves. They also seek shelter under shrubs, in burrows of other animals, or among rocks.

Authority: Charlie Painter, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9901.

White Sands pupfish (Cyprinodon tularosa) - Inhabits fine mud-silt and sand-gravel bottoms of clear, shallow, strongly alkaline pools and streams. Found in the area where Lincoln, Otero, Sierra, and Socorro Counties converge.

Authority: David Propst, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 87503, (505) 827-9906.

Grama grass cactus (Pediocactus papyracanthus) - Located primarily in New Mexico and central Arizona on open flats in grasslands and pinyon-juniper woodlands at 5,000-7,300 feet elevation. Plants commonly grow in sandy-gravelly soils and occasionally in gypseous soils. This species may have been considerably more widespread and abundant. Livestock grazing perhaps has reduced both the numbers and range of the cactus.

Authority: Robert Sivinski, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division, P.O. Box 1948, Santa Fe, New Mexico 87504-1948, (505) 827-7865.

Night-blooming cereus (Cereus greggii var. greggii) - This species is a cactus with slender, strongly angled stems with four to six prominent ribs, erect to reclining, up to 6 feet long and 0.5 inch in diameter. The flowers are white, opening at night, and are about 8 inches long. The plants grow in washes or flats, at about 3,000 to 5,000 feet, often under bushes or shrubs. The flowers appear in June. The plants are popular among cactus collectors and local populations are often completely wiped out by collecting.

Authority: Karen Lightfoot, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division, P.O. Box 1948, Santa Fe, New Mexico 87504-1948, (505) 827-7853.

Alamo beard tongue (Penstemon alamosensis) - This species is a perennial herb green or grayish green with glabrous stems and leaves; basal leaves are elliptic or broadly lance shaped; and the stem leaves much smaller and in 2-4 pairs, usually lance shaped. Stems are 12-40 inches tall, the bright red flowers in a long, narrow inflorescence, often secund or turned to one side, the corollas about 1 inch long and funnel shaped. The staminode or sterile stamen is without hairs on the tip. The plants flower in May and June. Plants grow in canyon bottoms, crevices, and pockets in rocky limestone and on north facing slopes on the west side of the Sacramento Mountains at 4,500 to 6,200 feet elevation.

Authority: Robert Sivinski, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division, P.O. Box 1948, Santa Fe, New Mexico, 87504-1948, (505) 827-7865.

Sacramento prickly poppy (Argemone pleiacantha ssp. pinnatisecta) - This plant is found in rocky canyon bottoms and slopes and occasionally along roadsides at 5,000 to 7,000 feet elevation. The white flowers bloom from May to August.

Authority: Robert Sivinski, New Mexico Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division, P.O. Box 1948, Santa Fe, New Mexico 87504-1948, (505) 827-7865.



United States Department of the Interior



FISH AND WILDLIFE SERVICE
611 E. Sixth Street
Grants Bldg., Fourth Floor
Austin, Texas 78701

2-15-91-I-005

November 12, 1991

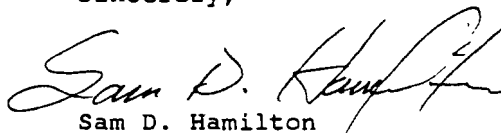
Mr. Joseph J. Campo, Ph.D.
Geo-Marine Incorporated
1316 Fourteenth Street
Plano, Texas 75074

Dear Mr. Campo:

This responds to your letter dated October 7, 1991 requesting a species list for use in the preparation of an environmental assessment and programmatic environmental impact statement for the Roving Sand Joint Training Exercises proposed to be conducted at White Sands Missile Range, New Mexico and Fort Bliss, Texas. Enclosure 1 lists species of concern to the U.S. Fish and Wildlife Service in the vicinity of Fort Bliss, Texas. The list is confined to the portion of the project that lies within this office's jurisdictional boundaries in El Paso County, Texas and contains listed animal and candidate plant species. County-by-county locations for candidate (C2) animal species were not readily available thus were not included in this list. The Ecological Services Field Office in Albuquerque, New Mexico, should be contacted for information regarding the remainder of the project.

Thank you for your request. If you need additional information or have questions or comments, please contact Karen Cathey at FTS 770-5436 or 512-482-5436.

Sincerely,


Sam D. Hamilton
Field Supervisor

Enclosure

cc: Field Supervisor, FWS, Ecological Services, Albuquerque, NM

ENCLOSURE 1
Species of Concern for
Proposed Roving Sands Joint Training Exercises
At Fort Bliss, Texas
November 12, 1991

Species	Scientific Name	Status
Sneed pincushion cactus	<i>Coryphantha sneedii</i> var. <i>sneedii</i>	E
American peregrine falcon	<i>Falco peregrinus anatum</i>	E
Night-blooming cereus	<i>Cereus greggii</i> var. <i>greggii</i>	C2
Dense pincushion	<i>Coryphantha dasyacantha</i> var. <i>dasyacantha</i>	C2
Comal snakewood	<i>Colubrina stricta</i>	C2
Sand sacahuista	<i>Nolina arenicola</i>	C2
Dune prickly pear	<i>Opuntia arenaria</i>	C2
Hueco Mtn. rock daisy	<i>Perityle huecoensis</i>	C2

E = Endangered

C2 = Category 2 on Notice of Review



P.O. BOX 511
EL PASO, TX 79961-0001
PHONE: 915-594-5500
FAX: 915-594-5699

November 6, 1991

Mr. Joe Campo
Geo-Marine, Incorporated
612 America Street
Baton Rouge, LA 70802

RE: Request for Information Related to Operation Roving Sands

Dear Mr. Campo:

Thank you for your inquiry related to operation Roving Sands which will be held in May, 1992. In order to assist you in your preparation of an environmental assessment, I have compiled and enclosed information related to the water quality and quantity.

I have enclosed eight documents in response to your inquiry which are described as follows:

1. A brief description of the Hueco Bolson aquifer which is the major groundwater supply source for Fort Bliss and El Paso.
2. Water quantity supplied to Fort Bliss since 1906 (A) and military pumpage by well since 1903 (B).
3. Quality of water supplied to Fort Bliss by El Paso Water Utilities in terms of (A) conventional chemical constituents; and (B) trace element analyses.
4. General information about the water quality supplied to the City of El Paso which includes Fort Bliss.
5. A brochure describing the wastewater reclamation project operating in the Hueco Bolson.
6. Information showing declines in military groundwater levels since 1900.
7. Information showing trends in military groundwater quality since 1900 in graphical form (A) and in tabular form (B).
8. Groundwater contour decline maps (A - C).

Although El Paso's water supply system is fully interconnected, it is highly unlikely that Fort Bliss receives any water from surface or reclaimed supplies. If there is any further information you need, please call John Balliew at 915.594.5515.

Sincerely,

A handwritten signature in black ink, appearing to read "Edmund G. Archuleta".

Edmund G. Archuleta, P.E.
General Manager

TEXAS AIR CONTROL BOARD

12124 PARK 35 CIRCLE, AUSTIN, TEXAS 78753, 512/908-1000

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Air Quality Control Region XI
1200 Golden Key Circle, Suite 369
El Paso, Texas 79925-5815
November 6, 1991

Mr. Joseph Campos
Geo-Marine, Incorporated
612 American Road
Baton Rouge, Louisiana 70802

Dear Mr. Campos:

Enclosed is the information you requested regarding air quality designation for El Paso. In addition to the general designation information for PM-10, Ozone and Carbon Monoxide, I have included a copy of the recently revised PM-10 State Implementation Plan. As you will find, there is some discussion therein concerning Fort Bliss and its contribution to overall particulate pollution. Information on SO₂, lead and NO₂ is not included because El Paso does not exceed the National Standard for these pollutants.

If I can be of further assistance, please call me at 915/591-8128.

Sincerely,

Archie C. Clouse
Environmental Quality Specialist

Enclosures



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

February 24, 1992

Mr. Joe Campo
Geo-Marine
201 Napoleon Street
Baton Rouge, LA 70802

Dear Mr. Campo

As per our recent phone conversation, I am sending you all available STORET ambient water data for the period of record from January 1, 1985 to present. The data covers the Texas County of El Paso and the New Mexico Counties of Dona Ana, Lincoln, Sierra, Socorro and Sandoval. The printout consists of two portions; the first being a detailed presentation of data for 117 monitoring stations located in the specified geographic area and the second a gross summary of the data as found in the 117 stations. I am also enclosing a STORET remarks sheet to aid in the interpretation on remarked data and two reprints on the National Environmental Policy Act which I hope may be of use to you.

Respectfully;

A handwritten signature in cursive script that reads "Paul C. Koska".

Paul C. Koska
Environmental Engineer

ENCLOSURES



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Distribution List for Roving Sands 92

U.S Army Corps of Engineers
Fort Worth District
Arver Ferguson, Jr. (CESWF-PL-RE)
P. O. Box 17300
Fort Worth, Texas 76102-0300
817/334-3246 or 2095

Commander, U. S. Army
Air Defense Artillery Center and Ft. Bliss
Attn: Environmental Management Office (Mr. Kevin von Finger)
Bldg. 1105
Fort Bliss, Texas 79916-0058
915/568-7930

Commander, U. S. Army
Air Defense Artillery Center and Ft. Bliss
Attn: Environmental Management Office (Dr. Glen DeGarmo)
Bldg. 1105
Fort Bliss, Texas 79916-0058
915/568-7930

Commander, 11th ADA BDE
Attn: AFVJ-C-OP (Major Robert Eslinger)
Bldg. 2525, Rm. 202
Fort Bliss, Texas 79916
915/568-6100

STEWS-NR-PA (Attn: Captain Thomas A. Ball)
Bldg. 1530, Rm. 284
WSMR, New Mexico 88002-5113
505/678-3512

Major Edwin Eiswerth, USAF
HQ FORSCOM
FCJ3-OX
Ft. McPherson, GA 30330-6000
404/669-2569

Mr. Thad Keefe
Environmental Branch
HQ FORSCOM
ATTN: FCEN-CED-E
Ft. McPherson, GA 30330-6000
404/669-7815

STEWS-ES-E (Attn: Mr. Bob Andreoli)
Bldg. T-150, Rm. 202
WSMR, New Mexico 88002-5048
505/678-2224

STEWES-ES-E (Attn: Mr. Bob Burton)
Bldg. T-150, Rm. 202
WSMR, New Mexico 88002-5048, 505/678-8731

Mr. Bill Montoya, Director
New Mexico Game and Fish Division
Santa Fe, New Mexico 87503

Ms. Jennifer Fowler-Propst, Field Supervisor
U. S. Fish and Wildlife Service
Ecological Services
Suite D, 3530 Pan American Highway, NE
Albuquerque, New Mexico 87107

Ms. Karen S. Lightfoot
Energy Minerals and Natural Resources Department
Forestry and Resources Conservation Division
P. O. Box 1948
Santa Fe, New Mexico 87504-1948
505/827-5830

Mr. Ray Sanchez
Bureau of Land Management
Las Cruces District
1800 Marquess Street
Las Cruces, New Mexico 88005
505/525-8228

Mr. Justin Ormsby, Executive Director
Rio Grande Council of Governments
1014 N. Stanton Street
El Paso, Texas
915/533-0998

Dr. Rudolph A. Rosen, Director
Fisheries and Wildlife Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744
512/389-4970

Mr. Sam D. Hamilton
Field Supervisor
U. S. Fish and Wildlife Service
611 E. Sixth street
Grants Bldg., Fourth Floor
Austin, Texas 78701
512/482-5436

Director
U. S. Environmental Protection Agency
1445 Ross
Dallas, Texas 75202-2733

Director
New Mexico Environment Department
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503
505/827-0817

Dr. Patricia Melhop, Director
New Mexico Natural Heritage Program
University of New Mexico
2808 Central Avenue
Albuquerque, NM 87131
505/277-1991

Commander
U.S. Army, WSMR
STEWS-ES-E (Attn: Joaquin A. Rosales)
Bldg. T-150, Rm. 204
WSMR, New Mexico 88002-5048

U.S. Fish and Wildlife Service
Ms. Nita Fuller, Supervisor
San Andres Refuge
P. O. Box 1306
Albuquerque, NM 87103

Mr. Dennis Ditmanson
WSMR National Monument
P. O. Box 458
Alamogordo, NM 88310

Mr. Thomas W. Merlan
State Historic Preservation Officer
Villa Rivera Building
228 East Palace Avenue
Santa Fe, NM 87503

Commander
Carrier Air Wing 14
Naval Air Station
Miramar, CA 92121

Commanding General
U.S. White Sands Missile Range
ATTN: STEWS-ES-E/Daisan Taylor
WSMR, New Mexico 88002-5048

Commander
U.S. Army Environmental Hygiene Agency
ATTN: HSHB-MO-B/Bill Russell
Aberdeen Proving Ground, MD 21010-5422

